

Metal Finishing

POLISHING AND BUFFING • BARREL FINISHING • CLEANING
PLATING • ANODIZING • RUST PROOFING • LACQUERING & ENAMELING

FEBRUARY, 1958

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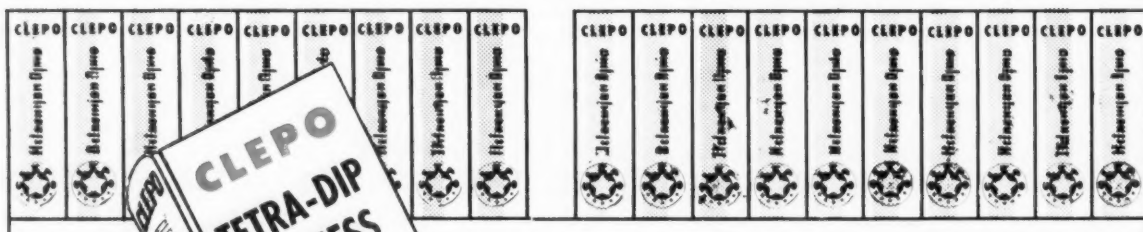
Science for Electroplaters

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CLEPO TETRA-DIP PROCESS Assures Oil-Free, Oxide-Free Welding Surfaces



CLEPO Products—all products—have back of them more than 25 years of continuing research and field studies for improving their effectiveness.

It is no secret that effective welding—spot, heliarc, or any other kind—depends heavily upon clean contact surfaces. To those using the CLEPO Tetra-Dip Process, it is no secret as to why they are getting excellent results. CLEPO 86-P—one of the compounds in our process—is an outstanding alkaline inhibited cleaner for removing oil, lettering, and other foreign matter requiring an effective detergent. CLEPO 180-S takes care of any oxide deposits just as effectively. Neither harms the aluminum surface in any way.

The next time the CLEPO Field Service man calls, ask him about the CLEPO Tetra-Dip Process for preparing aluminum surfaces. If you are having trouble now, just put in a phone call and we'll have him at your plant in short order.

FREDERICK

GUMM

Chemical Company Inc.

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Which of ENTHONE's metal-finishing developments do you need?

- ☐ **ENSTRIP METAL STRIPPERS**—Products for quickly and economically stripping defective plated coatings, coatings from plating racks, excess solder, silver brazing metal and metal smuts, without attacking base metals in any way.
- ☐ **ENAMEL STRIPPERS**—A wide variety of strippers are maintained "in stock". In addition, Enthone will be glad to study your requirements and develop the precise stripper you need to meet your requirements.
- ☐ **"ALUMON"**—A product of highest-purity chemicals for preparing aluminum for plating. Used successfully for over 13 years by hundreds of manufacturers, Alumon is economical and easy to use.
- ☐ **EBONOL® METAL BLACKENERS**—Products for blackening copper, brass and other copper alloys; iron and steel; zinc plate and zinc castings.
- ☐ **RUST REMOVERS**—A complete line of chemicals for the removal of rust and scale. Both alkaline and acid compounds are available.
- ☐ **CLEANERS & DEGREASERS**—New alkaline and emulsion-type cleaners for removing grease, oil, and solid dirt from metals.
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- ☐ **ZINC & CADMIUM CONVERSION COATINGS**—Enthox® salts produce iridescent, gold colored chromate coatings with high salt-spray resistance. Very simple and economical to use.

Remember — your metal finishing problem is our business! Since Enthone has been studying these problems, and developing their solutions, for 20 years, chances are we have the answer to your problem in stock. On the other hand, if yours is an unusual requirement, we will be glad to study your needs and develop the precise chemical for the purpose. Just send us a letter, outlining the problem or process—and enclose a sample of the metal concerned, if possible.

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PRODUCTS OF *Enthone* THE SCIENTIFIC SOLUTION OF METAL FINISHING PROBLEMS

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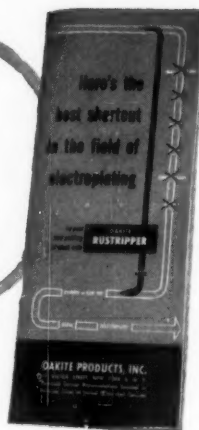
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Metal Finishing Processes • Electroplating Chemicals

SUBSIDIARY OF AMERICAN SMELTING AND REFINING COMPANY

Platers find many uses for chelating* cleaner

*Chelating (pronounced key-lating) cleaners convert metallic salts and oxides into compounds soluble in water.



By chelating and removing rust or heat scale at the same time that it removes oil, Oakite Rustripper combines pickling and alkaline cleaning into one operation. It also avoids disadvantages of acid pickling, such as hydrogen embrittlement and etching of machined surfaces.

Platers now use Rustripper for dozens of difficult steel-cleaning jobs. Here are some examples reported in recent weeks:

CALIFORNIA: "Rustripper has ended pickling damage such as embrittlement." (Removing oil and light rust from machined landing gears before cadmium plating.)

NEW YORK: "Now saving about \$10.40 per day on removing rust and scale and producing brighter plate." (Rustripper, added to reverse current cleaner in automatic plating machine, has eliminated separate pickling of wire towel racks before nickel and chrome plating.)

CONNECTICUT: "Rustripper added to reverse current cleaner has eliminated troublesome smut from metal furniture prior to copper-nickel-chrome plating."

NEW YORK: "Rustripper very good in barrels for derusting and brightening business machine parts . . . also for removing brown stains from parts put through black oxide treatment."

NEW YORK: "Small steel aircraft parts were embrittled by acid pickling. Rust, heat scale and stains are now safely removed by Rustripper and cyanide."

NEW JERSEY: "Only two cleaning rejects in first 15,000 parts plated." (After Rustripper was added to reverse current cleaner in automatic plater to eliminate smut from tubular steel furniture.)

INDIANA: "Rustripper is the best barrel compound we ever used for this job." (Removing tough heat treat scale from steel screws.) "Total cleaning and zinc plating time has been cut in half."

NEW YORK: "Had trouble with light rust on business machine parts before cadmium plating; also with smut left after electrocleaning. Rustripper cured both troubles."

FREE A 14-page illustrated booklet called "*Here's the best shortcut in the field of electroplating*" tells about many ways in which Oakite Rustripper can be of great value in the plating shop. Write to Oakite Products, Inc., 18 Rector St., New York 6, N. Y.



Technical Service Representatives in Principal Cities of U.S. and Canada
Export Division Cable Address: Oakite

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Metal Finishing is published monthly by the Finishing Publications, Inc., 381 Broadway, Westwood, New Jersey, U.S.A.
Entered as second class matter at the Post Office in Westwood, N. J. Volume 56, No. 2, February, 1958. Four Dollars Per Year.

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Plating, Polishing Equipment, Supplies for
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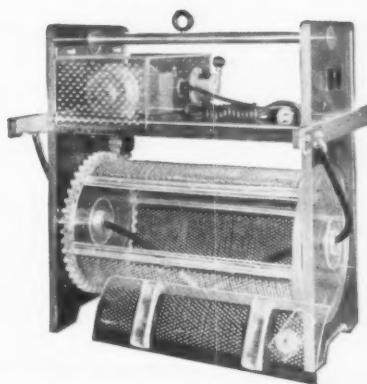
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[Photo courtesy of Chromium Corporation of America]

Reduce rejects — plate with Mutual low-sulfate chromic acid

When you chromium plate components like these cylinder liners for big diesels you can't risk a reject tag because the job didn't meet specifications.

One form of insurance against plating difficulties is MUTUAL Chromic Acid. Every drum is sampled and analyzed before shipment to make sure that it has a minimum assay of 99.75 per cent CrO_3 , and that

its sulfate content never exceeds 0.1 per cent.

Rigid quality control in the manufacture of MUTUAL Chromic Acid guarantees the uniformity of the product, making it easier for the plater to accurately control the chromic acid-sulfate ratio of his plating bath.

Mutual Chromium Chemicals



Sodium Bichromate
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MUTUAL CHROMIUM CHEMICALS
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Please send:

- ☐ Bulletin 52 — Chromium Chemicals — Their History, Properties and Uses.
- ☐ Bulletin 13 — Anodizing Aluminum by The Chromic Acid Process.

NAME _____ POSITION _____

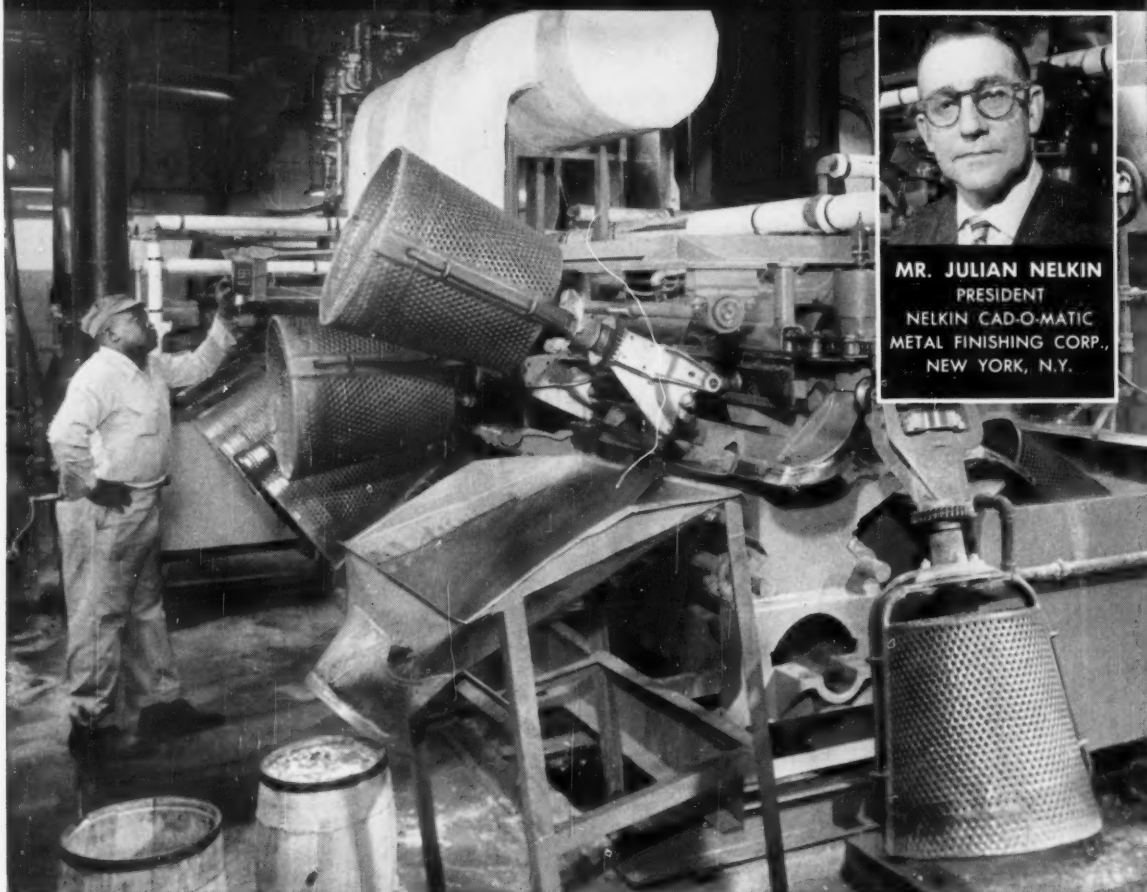
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P2-9-4

**"THIS STEVENS AUTOMATIC BARREL PLATING MACHINE IS
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This is the kind of production and economy that Stevens' users have come to depend on. They know

their Stevens Automatics will deliver *accurately — economically — dependably —* everytime!

If your present method of plating isn't giving you all these advantages, better call your local Stevens Representative right now! Let him show you the Stevens automatic barrel plating way to more profitable metal finishing!

Remember — When you go *automatic* . . . go STEVENS!

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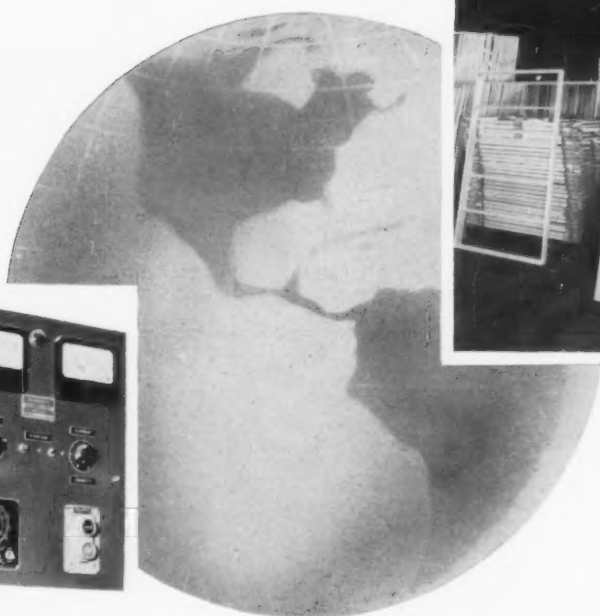
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Automatic Current Density Control" ...*

... says John Gurniak of

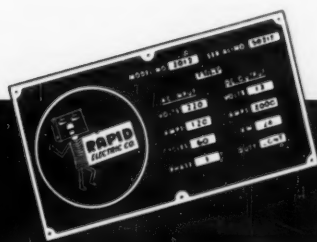
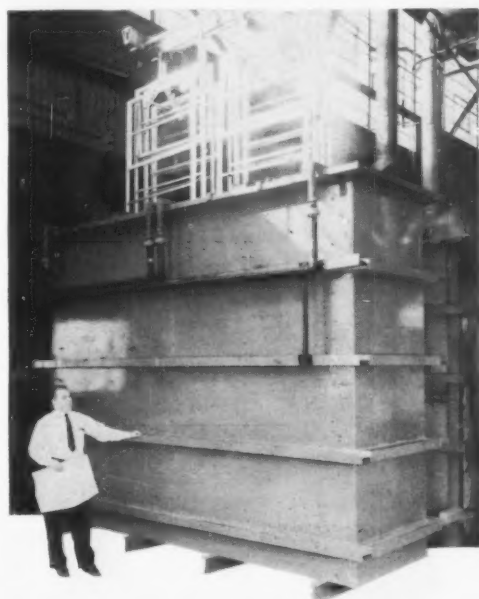
MICHAEL FLYNN MFG. CO., PA.

*"and that big difference is the accuracy and
simplicity in which a pre-determined
film thickness can be controlled."*

*"We chose RAPID ELECTRIC'S
Automatic Current Density Control
rectifiers to eliminate the problem of
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change. One setting, and the rectifier
automatically maintains a constant current
density per square foot of work."*

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*"Once more, with the possibility of
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of quality is assured."*



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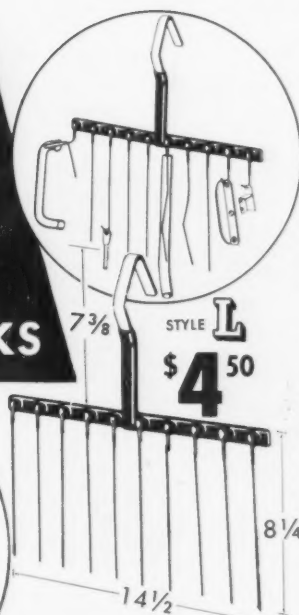
New, Ready Made Mass-produced Economy Plating Racks



1/4" copper rod
heavy plastisol coat
Less than 100, \$.45
100 or more, .40
available in 1/8" rod.

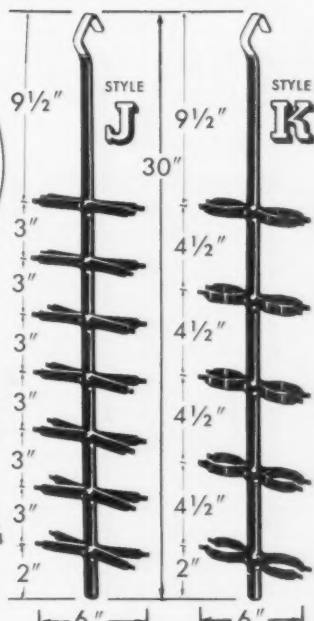


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Straight .093 dia. phosphor bronze wires; 8" long, 1 1/2" centers. Wires easily shaped or shortened.

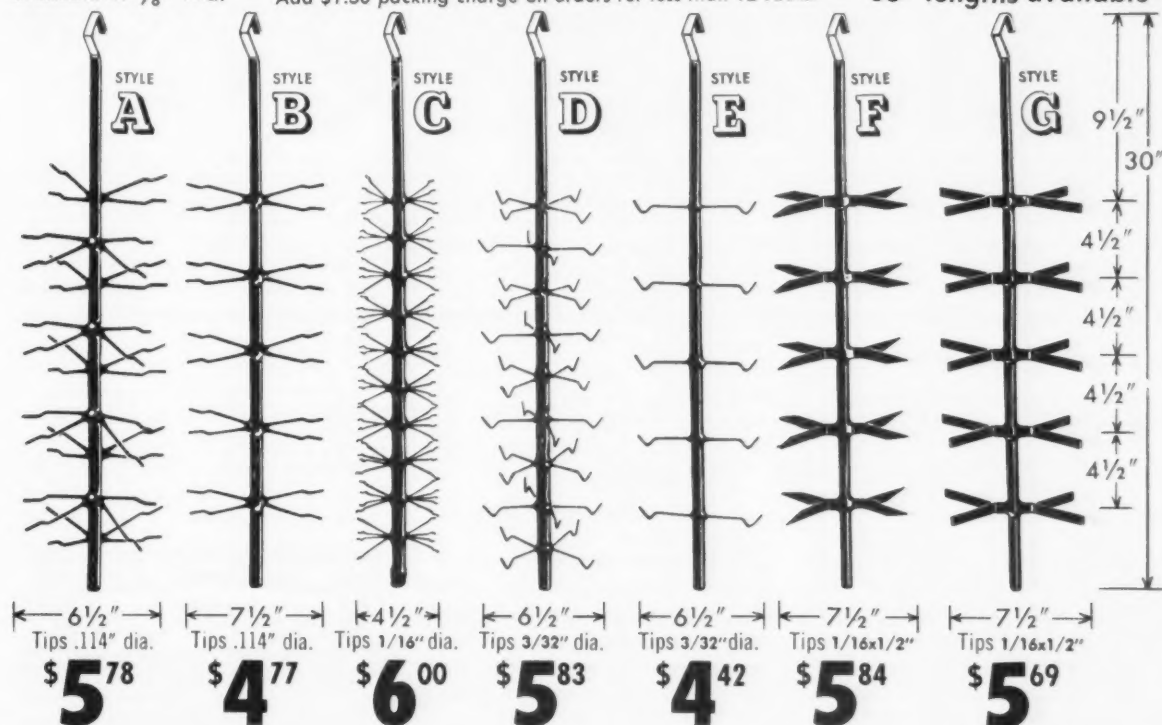


Tips 1/16x1/2"
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Tips 1/16x1/2"
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Add \$1.50 packing charge on orders for less than 12 racks.

36" lengths available



Spines one-piece solid copper round cornered and sand blasted. Tips phosphor bronze, riveted to spine and soldered when necessary for complete rigidity. Coated after assembly with BELKE Universal Plastic.

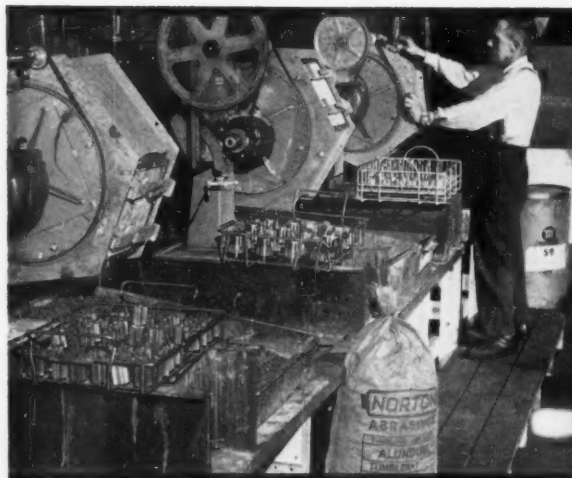
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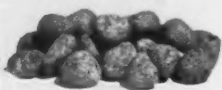
Money savers for all barrel finishing jobs



Small bench barrels with 7 cu. ft. capacity in production line operation. Alundum Tumblex "T" Abrasive is used for finishing irregular shapes.



A 4 cu. ft. capacity production barrel being unloaded after finishing operation. Thirteen cu. ft. production barrel shown in left background.



ALUNDUM® TUMBLEX "A" Abrasive. For general barrel-finishing. Removes flash, scale, tool marks and burrs, while forming radii and finishes to required micro-inches. Seventeen sizes.



ALUNDUM TUMBLEX "T" Abrasive. Bonded, triangular and fast-cutting for special shaped parts. They won't wedge in work slots or holes. Four sizes.



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TUMBLEX "N" Abrasive. Natural stones, exclusively Norton. For high lustre, especially on die castings and soft metal. Rounded shape brings up highest lustre. Seven sizes.

For finishing any part . . . in any barrel, large or small . . . there's an exactly right type and size of Norton TUMBLEX* abrasive

For lower costs in deburring, de-scaling and finishing parts to close tolerances, be sure to choose:

- The right barrel equipment, available in a wide range of types and sizes.
- The right Norton TUMBLEX abrasive — made in four entirely different types, each in many different sizes and each engineered to add the "Touch of Gold" that brings lustre and boosts profits in finishing the widest variety of parts.

Send samples of parts you finish — large or small, simple or intricate to our Sample Processing Department. We'll barrel finish, return samples, and tell you exactly the methods and abrasives you need to improve product quality and cut costs.

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ABRASIVES

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to make your products better*

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G338



News about COATINGS for METALS

Metallic.....Organic.....Decorative.....Protective

Chromium plating goes "specialized"

A BARREL OF SAVINGS IN SMALL PARTS PLATING

The continuous Unichrome plating barrel designed by Metal & Thermit is a real production tool. It equals 4 batch type barrels in output; plates up to 200 pounds of parts per hour. It offers "automation" to plants that must chromium plate hundreds of thousands of small parts per day.

.....

Immersion heater uses tough tantalum

An advanced type of electric immersion heater developed by M&T uses an acidproof tantalum tube to protect the heating element, promote good heat transfer. This tantalum sheath eliminates cracking such as may be encountered with brittle quartz heaters. Thermostatically controlled, the unit is rated at 5 KW, develops 17,000 Btu/hr—enough heat to raise 100 gallons of water 20°F per hour.

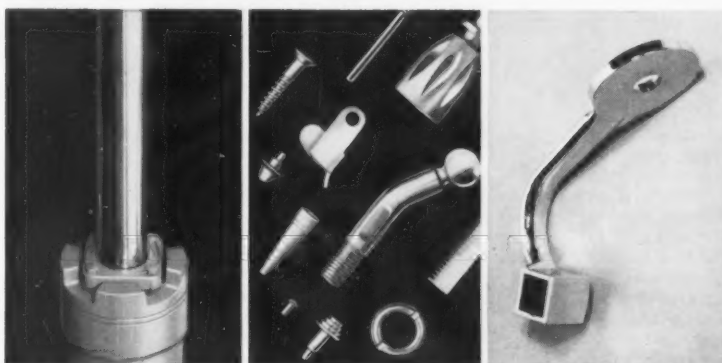
Send for data on above equipment.

Unichrome is a trademark of Metal & Thermit Corp.



General Offices: Rahway, New Jersey
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Deposits and bath characteristics matched to different needs



Chromium plating can be matched to different production and deposit requirements. Examples: (Left) Hydraulic rams get increased resistance to corrosion with Crack-Free Chromium. (Center) Quality is assured on barrel plated small parts by a special SRHS Bath. (Right) Both operations and results are improved in decorative plating with SRHS Chromium.

Meeting today's demand for more automation and specialized production "tools," M&T offers a line of processes to satisfy any chromium plating need. "Chromium is chromium" cannot be considered an accurate statement any longer. Chromium can differ in the way it is deposited and in nature of the deposit.

THE DIFFERENCES

Unichrome Crack-Free Chromium is a new type of ductile deposit in that it is free from the cracks riddling ordinary chromium. It affords more corrosion protection, reduces nickel need. It also withstands thermal shock better, and improves wear resistance. Thus, it is being used where electrodeposits formerly proved inadequate. Crack-Free Chromium, like all other Metal & Thermit chromium solutions, is self-regulated or "automated."

For other requirements, Unichrome SRHS® Chromium Baths have the advantages over ordinary chromium of wider bright plate

range, self regulation for optimum plating balance, up to 80% more speed. While the SRHS deposit is similar to ordinary chromium structurally, the way it plates makes a substantial difference in the output. It permits plating more work per load, cuts rejects due to missing and burning.

VARIOUS SOLUTIONS

The SRHS line offers a number of different solutions with varied operating characteristics. This selection makes possible exact cost-reducing and quality-improving matches between plating solution and production requirements. Developed especially for barrel chromium plating, one bath in the group assures lower cost high quality finishes on volumes of small parts.

All a plant needs is a tank and electrical service. Metal & Thermit can round out the installation with experienced technical aid and the only complete line of processes and equipment for the requirements.

SPECIAL REPORTS ON FINISHING NON-FERROUS METALS

NUMBER III—Lustrous, Corrosion-Resistant Finishing with Chemical Polishing Iridite

WHAT IS IRIDITE®

Briefly, Iridite is the tradename for a specialized line of chromate conversion finishes. They are generally applied by dip, some by brush or spray, at or near room temperature, with automatic equipment or manual finishing facilities. During application, a chemical reaction occurs that produces a thin (.00002" max.) gel-like, complex chromate film of a non-porous nature on the surface of the metal. This film is an integral part of the metal itself, thus cannot flake, chip or peel. No special equipment, exhaust systems or specially trained personnel are required.

Chromate conversion coatings are widely accepted throughout industry as an economical means of providing corrosion protection, a good base for paint and decorative finishes for non-ferrous metals. Certain of these coatings also possess chemical polishing abilities that have luster-producing, as well as corrosion-inhibiting, effects on zinc and cadmium plate, zinc die castings and copper alloys. However, continued developments in this field have been so rapid that many manufacturers may not be completely aware of the breadth of application of this type of finish. Hence, this discussion of the many ways in which this chemical polishing characteristic can be used in final finishing or pre-plating treatments to produce a lustrous appearance with distinct display and sales appeal and appreciable savings in cost. Report I on decorative, corrosion-resistant finishes and Report II on paint base corrosion-resistant finishes are available on request.

The degree of luster possible on a surface is a function of the degree to which the surface can be smoothed. Leveling to provide a smooth surface can be achieved by mechanical or chemical means, or a combination of these, depending upon the luster desired and the original condition of the metal. Chemical polishing effectively imparts luster otherwise difficult and costly to obtain. For this reason, it is often used to supplement or entirely replace mechanical polishing, depending upon the application and the original condition of the metal. Chemical polishing has the additional advantage of providing overall treatment of the submerged part. It reaches into even the deepest corners and recesses that are otherwise inaccessible. Certain of the Iridites are specifically designed to perform this chemical polishing operation. Also, they provide corrosion protection as do all Iridites, thus may be used as a final finish or a pre-plating polish.

If Iridite is to be used as a final finish, in contrast to pre-plating treatment, the chromate conversion coating generated is allowed to remain, providing good corrosion resistance. Color inherent in these Iridite films ranges from a yellow cast to yellow iridescent. These coatings may be used without further treatment where this color is acceptable and good corrosion resistance is desired. Further, these basic coatings can be tinted by dyeing. Among the dye tints available are shades of red, yellow, blue and green. If desirable, the basic coatings can also be modified by a bleach dip leaving a clear bright or blue iridescent finish. In all cases bleaching reduces corrosion resistance.

As examples of this type of final finishing, Iridites #4-73 and #4-75 (Cast-Zinc-Brite) make possible for the first time, lustrous chemical polishing of the as-cast surface of zinc die castings. Thus, in many cases, sizeable savings in finishing cost are realized by elimination of plating costs. This economical method can be used on tools, appliance parts, toy pistols, locks and many other small castings. Another example is the treatment of copper and brass parts, such as welding tips, to eliminate buffing and provide additional corrosion resistance. In many cases, handling costs are reduced appreciably by replacing piece-part handling with bulk processing. Still another example of the use of this chemical polishing and protective quality of Iridite is a simple system of zinc plate, Iridite and clear lacquer instead of more costly electroplated finishes. Typical of this type of lustrous finish are builders hardware and wire goods.

As a pre-plating treatment, in contrast to final finishes, Iridite can be used to chemically polish zinc die castings or copper prior to plating. In such cases, Iridite should be applied as an in-process step, so that the protective film is removed before the plating cycle. The savings in hand-

ling, material and labor costs are obvious. This process has made it practical to plate chrome directly over copper on steel, conserving nickel, yet producing a lustrous chrome finish. Used after stripping faulty plate in reprocessing zinc die castings, Iridite restores luster to the casting, thus making possible replating without blistering.

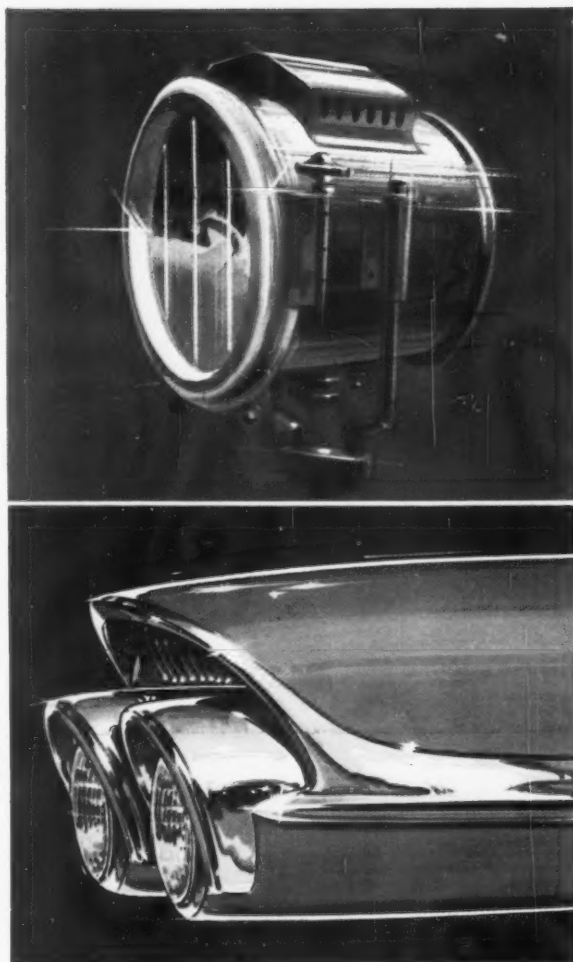
Other Iridite finishes are available to produce maximum corrosion resistance, a wide variety of decorative finishes and excellent bases for paint on all commercial forms of the more commonly used non-ferrous metals. As a final finish, appearance ranges from clear bright to olive drab and brown and many films can be bleached or dyed. As a paint base Iridite provides excellent initial and retentive paint adhesion and a self-healing property which protects bare metal if exposed by scratching. Iridites have low electrical resistance. Some can be soldered and welded. The Iridite film itself does not affect the dimensional stability of close tolerance parts.

Iridites are widely approved under both Armed Services and industrial specifications because of their top performance, low cost and savings of materials and equipment.

You can see then, that with the many factors to be considered, selection of the Iridite best suited to your product demands the services of a specialist. That's why Allied maintains a staff of competent Field Engineers—to help you select the Iridite to make your installation most efficient in improving the quality of your product. You'll find your Allied Field Engineer listed under "Plating Supplies" in your classified telephone book. Or, write direct and tell us your problem. Complete literature and data, as well as sample part processing, is available. Allied Research Products, Inc., 4004-06 East Monument Street, Baltimore 5, Maryland.

(ADVERTISEMENT)

Since the days of the oil and acetylene headlamp



Even back in 1910, part of an owner's pride in his car lay in gleaming brightwork. But polishing and buffing the shiny metal that he loved so well caused manufacturers plenty of headaches. And so they turned to Acme — and Acme has continued to supply the answers to their finishing problems.

Reduction of rejects, increased production volume, machine finishing of odd-shaped pieces . . . these are a few of the solutions Acme engineers have provided through the years.

Today Acme progressive engineering creates equipment that does a better, faster job than ever. And at low cost, too, because Acme engineers combine standard units with a wide variety of accessories to make *custom* buffing and polishing machines.

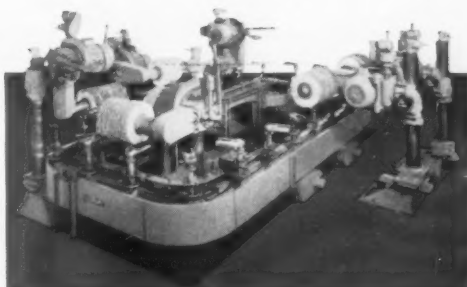
Every year of its history, Acme has encountered new finishing requirements—each an individual problem—and solved them. We can solve *your* problem, too.

ACME MANUFACTURING COMPANY

1400 E. 9 MILE ROAD, DETROIT 20, MICHIGAN

LEADING PRODUCERS OF AUTOMATIC POLISHING AND BUFFING EQUIPMENT SINCE 1910

Acme universal automatic polishing and buffing machine with camming and rotating fixture arrangement serving six Acme adjustable heavy-duty buffing lathes having 24" wide wheels. Automatic wheel wear compensation is featured. Operation is finishing automotive taillight component.



LET ACME
Polish Off
YOUR
FINISHING
PROBLEMS



Shoot your chrome questions at Diamond

Let DIAMOND's technical specialists zero in on your chrome-plating problems. These specialists are ready and able to handle your questions—quickly and completely. Their service is free.

In making chromic acid, DIAMOND controls quality from start to finish. DIAMOND experience begins with importing the chrome ore and making the soda ash. It includes *every step* through production and delivery, right up to standing by your side, if you wish, to help you get top-quality plating results consistently, economically.

DIAMOND facilities—two chromic acid plants and nine warehouses and sales offices across the country—assure you uninterrupted supply. DIAMOND ALKALI COMPANY, 300 Union Commerce Building, Cleveland 14, Ohio.



**Diamond
Chemicals**

A Timely Message on Ad Writing by Canines

by **Sox von Liebestraum Sax**

Ex Detroit Rep. and Assistant to

Ben P. Sax, Chairman of the Board
American Buff Company



That's Me!

How I long for the "good ol' dog days." No one then would have thought of asking me, Sox von Liebestraum Sax—dog of distinction and trusted assistant to Ben P. Sax, Chairman of the Board of American Buff Company—to write an ad selling the world's greatest buffs.

Being a sharp-witted gray-flannel type, I pointed out that practically everybody and his canine was already using American Buffs. What else would make American Buff Company the No. 1 manufacturer in the business? We don't need to advertise, said I.

Nobody disputed that American was the No. 1 buff in quality and sales. So they took a different tack—appealed to my canine vanity. Show them how superbly you handle the English language, someone suggested. I yielded.

Take a tip from this ad-writing canine: Check the terrific results users are getting with American—little things like increases as high as 100% in output. Get the full story from your American Buff "Rep" and buy some—you know who gets the axe if this doesn't sell!

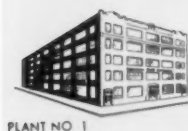


Cordially,

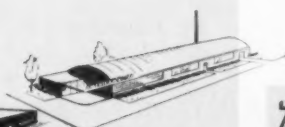
Sox von Liebestraum Sax

"For the Job that's TOUGH... use an AMERICAN BUFF"

World's Largest Manufacturer of Buffs and Polishing
Wheels for Every Finishing Operation



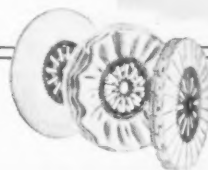
PLANT NO. 1



PLANT NO. 2



PLANT NO. 3



PATENTED CENTERLESS OR
PERMANENT CENTER CONSTRUCTION

American Buff Company

2414 S. LaSalle St., Chicago 16, Illinois • CA 1umet 5-1607

AMERICAN BUFFS ARE REGULARLY ADVERTISED IN FORTUNE MAGAZINE



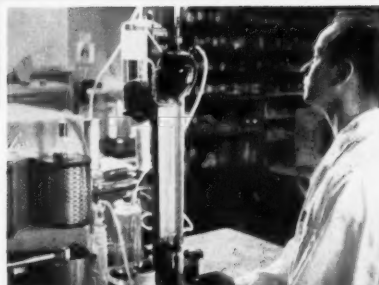
"Al, you must be crazy..."

"A few years ago we decided to make our Quality Control Lab as good as could be found anywhere. We staffed it with first rate people and bought the latest in equipment including the finest Spectrographic Instrument available. At this point, our accountant — you know the type — a nice enough guy, but never happy unless he's shaking his head and wiggling his fingers at you... said to me, 'Al, you must be crazy, putting all this money into Quality Control.'"

"Well, it took a lot of doing—and plenty of dollars, but it was worth it. We've grown steadily and it sure is a nice feeling to know that many of our regular customers include the finest platers in the country."

Al Kerzner

AL KERZNER, President



Illustrated are several views of our all new Wet and Spectrographic Laboratories, including some of the finest quality control equipment available.



If you're a user of Copper, Nickel or Zinc Anodes, and if quality (at a competitive price) is an important factor to you, contact us! We manufacture them in a variety of sizes and shapes, and we can make them to your specifications.

NEW JERSEY METALS COMPANY 720 Rockefeller St., Elizabeth 2, N. J.

Serving Industry from Coast to Coast — since 1920

ELizabeth 4-6336



BIFURCATOR[®] FAN

key to your corrosive fume removal problems

BIFURCATOR is the divided-housing fan backed by 30 years experience in design and application.

Ideal for corrosive, high temperature and hazardous fume removal from:

CERAMIC KILNS	FOUNDRIES —
CERAMIC PLANT	SHAKE-OUT AREAS
INSTALLATIONS	FURNACES
CHEMICAL PLANT	GLASS PLANTS
INSTALLATIONS	LITHOGRAPHIC OVENS
CHEMICAL LABORATORY	LUMBER DRYING KILNS
HOODS	METALLURGICAL PLANTS
CORE BAKING OVENS	METAL PICKLING VATS
DRYING OVENS	PAPER MILLS
DYE HOUSES	SLASHERS
ELECTROPLATING TANKS	STRIPPING TANKS
FOOD PROCESSING OVENS	TEXTILE MILLS
FOUNDRIES —	
POURING AREAS	

Mail coupon today for free Catalog DB-37-55.

De Bothezat FANS

A DIVISION OF
American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

DeBOTHEZAT FANS DIVISION, Dept. HC-258
American Machine and Metals, Inc.
East Moline, Illinois

- ☐ Send Bulletin DB-37-55 containing complete data on the Bifurcator for exhausting fumes.
- ☐ Have a DeBothezat representative call.

COMPANY _____

ADDRESS _____

CITY _____

ZONE _____

STATE _____

ATTENTION MR. _____

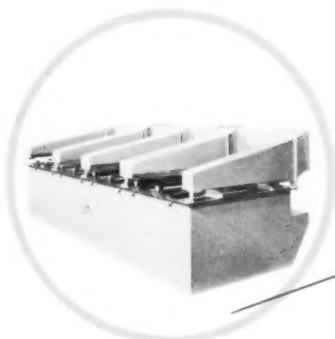
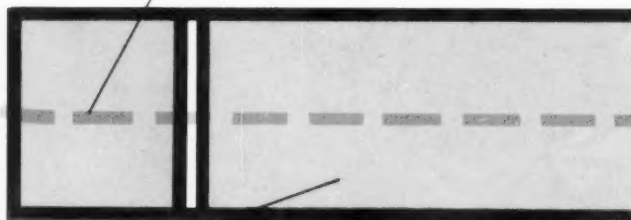
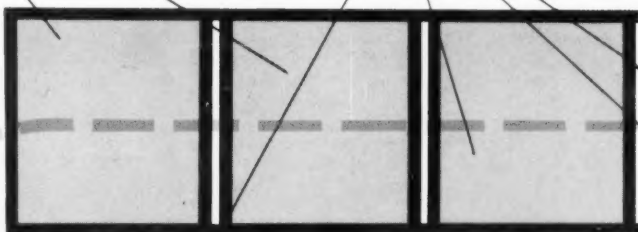
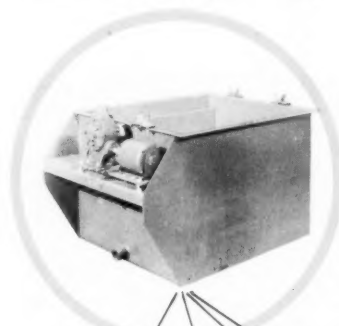
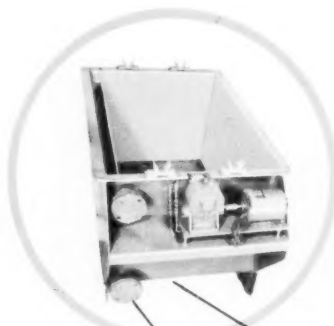
ECONOMY—EFFICIENCY— YOU GET ALL THREE FROM

MOTORIZED TANK (KOROSEAL LINED)

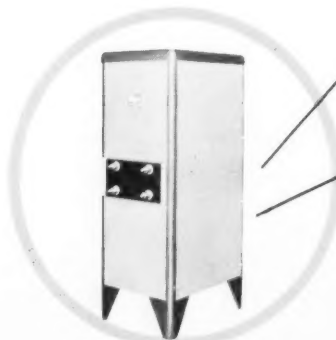
MOTORIZED TANK (NOT LINED)

Here is a typical alkaline or acid barrel plating plant layout designed by the UDYLITE Engineering Department for fast, efficient metal finishing. This system, with the proper UDYLITE equipment placed in a practical flow chart pattern, comprises the ultimate in modern plating production.

Naturally, different plant limitations and end-products require individually planned layouts. For this reason, the UDYLITE Engineering staff and their knowledge are available to you for your particular shop needs. If a modern, money-saving plating plant is your goal...why not let UDYLITE help you plan it!



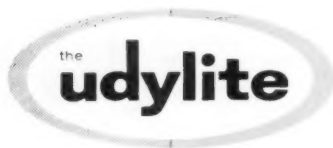
4 BARREL PLATE UNIT



1500 AMP SELENIUM RECTIFIER



HOPPER TYPE RINSE



corporation

detroit 11, michigan

world's largest plating supplier

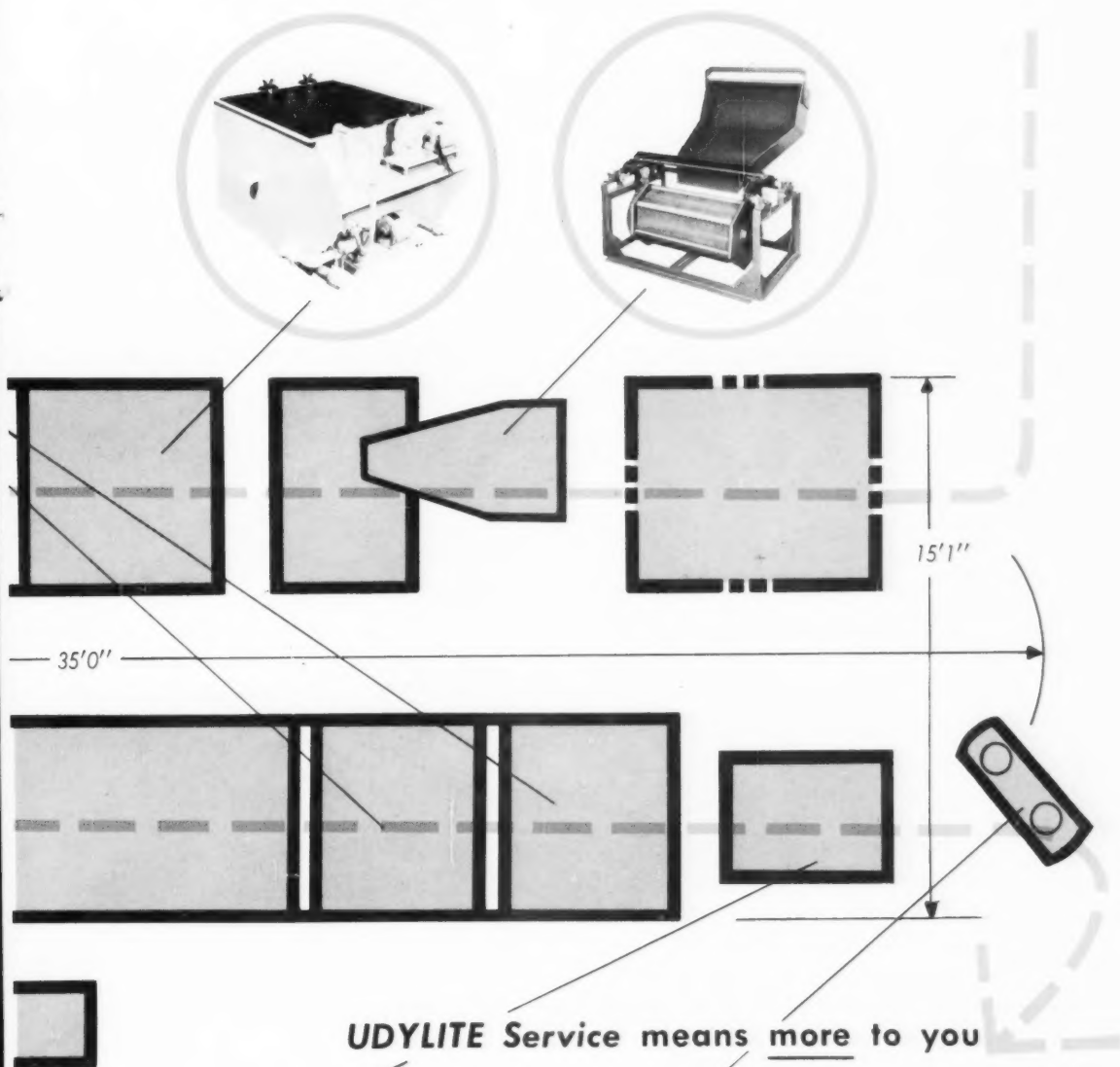
HIGH PRODUCTION

UDYLITE

PLANNED LAYOUTS

MOTORIZED CLEANING TANK

LOADING STAND



UDYLITE Service means more to you

No matter what your problem, from the designing and equipping of a complete plating plant, to the *right* answer on a plating process or choice of supplies, UDYLITE is at your service! The UDYLITE Customer Service Laboratories are ready to analyze and report on your plated samples and solutions at any time. The UDYLITE Engineering Department is ready to advise and assist you with everything from suggestions to specific planning.

If you're not taking advantage of UDYLITE's many diversified services, you'd better contact your local UDYLITE representative today! For progress in plating . . . with economical equipment, processes, and technical assistance . . . UDYLITE leads the way!

CENTRIFUGAL DRYER

USE NON-FLAMMABLE, NON-TOXIC, ODORLESS

Immunol

REG. U. S. PAT. OFF.

FOR ALL METALS



Users get outstanding benefits when they replace flammable, toxic solvents with IMMUNOL. The following is typical of the many case histories in our files: "We estimate IMMUNOL saves us \$30,000 to \$40,000 per year in materials, time and labor alone when used in tumbling stainless steel jet engine blades."

Get more jobs done...faster, safer, economically

• IMMUNOL does much more work—faster, easier and less expensively—than soaps, alkalis and flammable toxic solvents. It is a powerful wetting agent, the original non-alkaline, non-acid detergent and rust preventive that quickly cleans, degreases and rustproofs in one operation. Here's how you can use IMMUNOL:

• **AS A BUCKET SOLVENT** to remove oils, compounds, soils, greases, gummy deposits from any metal.

• **TO REPLACE SOLVENT AND VAPOR DEGREASING.** IMMUNOL is very efficient in this application. The

metal will be rustproofed and operators will not be bothered by odors, skin irritations or the danger of fire.

• **TO REPLACE OR IMPROVE ALKALI CLEANERS.** IMMUNOL can be used in many places where alkali cleaners are used without alkali burn. It is also used as an additive to alkalis to reduce the time cycle.

• **FOR TUMBLING METAL.** IMMUNOL can be used (1) before tumbling as a cold dip to remove punch press oils (2) as a rust inhibitor for the barrel and parts (3) in the barrel as a cleaner (4) as a dip rinse.

• **TO REMOVE BUFFING COMPOUNDS.** IMMUNOL is very effective in this application.

IMMUNOL is inexpensive. Only a few ounces per gallon of water are required to produce a gallon of solution which can be used over and over again. Write, wire or call for a free sample.

.....
There is a family of IMMUNOL products that produces outstanding results in many other metalworking applications. We'll send you details on these applications, too.
.....



Manufacturers of
HAMIKLEER, ACTIVOL, HAMICOTE,
STEELGARD, IMMUNOL

HARRY MILLER CORP.

Original Products and Processes Since 1936

4th and BRISTOL STS., PHILA. 40, PA.
DAvenport 4-4000

Service Representatives in Principal Cities

FOR BRIGHT ZINC LIKE THIS . . .

Only *Dual Action* ISO-BRITE® ZB567

- PRODUCES FULL BRIGHTNESS
- COST LESS PER POUND
- STANDS UP LONGER

and

**PERFORMS EQUALLY WELL
IN BOTH BARREL
AND RACK PLATING**

Rustproofing, Inc., President, Angelo Melone says: "Our automotive customers demand top quality brightness. ZB567 gives us an outstanding finish and enables us to meet competition and make a fair profit, too."

Substantial benefits for the plating plant and its customers! That's just what the record shows for Wagner's new Iso-Brite ZB567® and until you get an opportunity to prove our claims in your own tanks, be guided by the experience of a progressive plating plant which has used Iso-Brite ZB567 for many months:

Rustproofing, Inc., Detroit, now uses Iso-Brite ZB567 exclusively for both its lines—barrel and rack—thus reducing inventory greatly. The cost is appreciably less than their former additive which, however, could not be used successfully in both lines. Also according to Angelo Melone, Rustproofing president, less additive is required to achieve high quality brightness and only small daily additions are needed to maintain full efficiency. In addition, Rustproofing's freight charges are nil since the Wagner warehouses are located close to the centers of mass production. And perhaps above all, Rustproofing keeps its many customers completely satis-

fied with the fully bright finish they specify; day to day reliability of ZB567 has reduced rejects to an insignificant minimum.

If your production requires the protection of zinc plating, plus the appeal of an attractive, bright finish, you're money and customer satisfaction ahead when there's Iso-Brite ZB567 in the tanks. If you're handling small "bulk" parts which must be barrel plated, you're doubly rewarded by the simplified inventory and low costs of this two-fisted new additive. Now—when increased operating efficiencies offer the only remaining opportunity for meeting and beating competition—investigate this vital Wagner Brothers development. For full information on Iso-Brite ZB567 and the entire Wagner electroplating line of equipment, anodes, chemicals and other supplies, call our representative in your area. He'll be glad to assist you with all plating department problems.

MANUFACTURERS AND PROCESSORS OF ALL METAL-FINISHING CHEMICALS, ANODES, AND EQUIPMENT

418 MIDLAND AVE., DETROIT 3, MICHIGAN

CHICAGO • CINCINNATI • CLEVELAND • INDIANAPOLIS • NEW YORK • ROCHESTER • GRAND RAPIDS

Wagner
BROTHERS INC.

Greater convenience for you!

HARSHAW NOW SHIPS

FLUOBORATES IN

NON-RETURNABLE CONTAINERS

Harshaw's use of this 5-gallon polyethylene-lined steel pail brings important benefits to you:

YOU SAVE MONEY!

- No containers to return
- No records to keep
- No container deposit
- No return freight charges
- Less freight on incoming shipments

YOU SAVE WORK AND TIME!

- Light container—easy to handle even when full
- No special pouring equipment needed
- Built-in (pull out-push in) spout
- Specially designed for easy stacking



Convenient Stacking



Polyethylene Liner



Pull Out - Push In Spout

These Harshaw fluoborate chemicals are now shipped in non-returnable containers:

Cadmium Fluoborate Solution
Copper Fluoborate Solution
Fluoboric Acid
Hydrofluosilicic Acid
Lead Fluoborate Solution
Nickel Fluoborate Solution
Tin Fluoborate Solution
Zinc Fluoborate

Enter your order today—the same high quality Harshaw fluoborates, and in a convenient new container.

THE HARSHAW CHEMICAL CO.

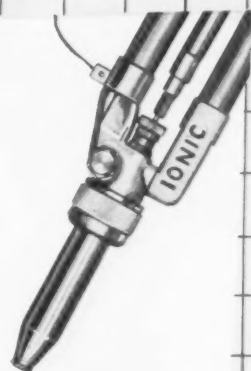
1945 E. 97th Street • Cleveland 6, Ohio

CHICAGO, ILLINOIS • CINCINNATI, OHIO • CLEVELAND, OHIO
 DETROIT, MICH. • HOUSTON, TEXAS • LOS ANGELES, CALIF.
 HASTINGS-ON-HUDSON, N. Y. • PHILADELPHIA, PENNSYLVANIA
 PITTSBURGH, PENNSYLVANIA

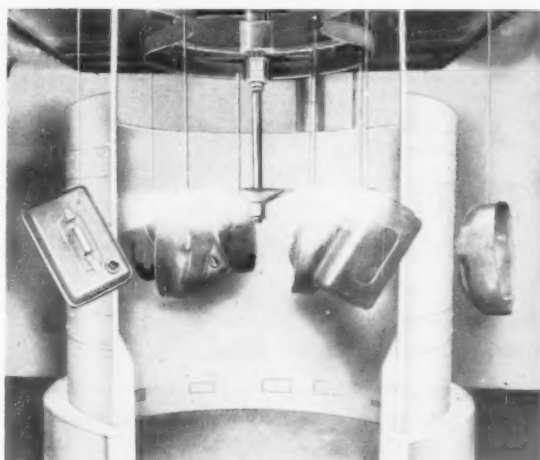
Invitation
to improve production

You are cordially invited to bring your products
for a **FREE** demonstration of Ionic
Electrostatic Spray Equipment.

R.S.V.P.



*Patented



IONIC CENTRIFUGAL ATOMIZER

**SOLVE YOUR FINISHING
PROBLEMS WITH AN
IONIC ELECTROSTATIC
SPRAY SYSTEM**

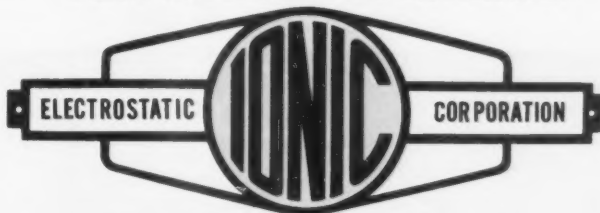
Features:

- ★ NO RENTALS
- ★ NO ROYALTIES
- ★ SPEEDS UP PRODUCTION
- ★ INCREASES PAINT MILEAGE

PROOF BY TRIAL IS OUR MOTTO

Before installing any automatic spray equipment, we urge you to investigate the many advantages of Ionic Electrostatic Spray Equipment. Our laboratory at Garfield, New Jersey, is at your disposal. Why not arrange for a **FREE** demonstration today? Ship your samples and coating materials to us with all pertinent information. We will then conduct tests and issue a detailed laboratory report with our recommendations.

WRITE TODAY FOR FREE LITERATURE.



111 MONROE STREET, GARFIELD, N. J.



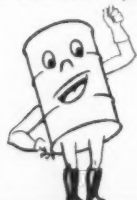
Cleaning Specialists*

* [SPE'CIAL·IST—One who devotes himself to some special branch of activity.]

At Northwest our "special branch of activity" is solving your cleaning problems.

Remember — YOUR COST PER FINISHED ARTICLE IS THE TRUE COST OF YOUR CLEANER.

Northwest's production-tested chemicals and "Right the first time" recommendations will save you money. Northwest Service is as close as your phone.



Behind your friendly, competent Northwest Sales Engineer stands a reputation for providing industry with low-cost, analytically-correct, job-adjusted chemical cleaners.

From Northwest's years of experience in formulating the RIGHT cleaner for your specific needs have come such developments as the LO-HI pH PROCESS—for cleaning prior to plating, painting, or vitreous enameling; ALKALUME PROCESS—for preparing aluminum and magnesium for finishing and spot welding; INTERLOX PROCESS—for phosphate coating; SPRA-LUBE—to control over-spray of "to-day's" paints in water wash paint booths; PAINT STRIPPERS—specific to your needs; SUPER-DRAW & FLUID FILM—for drawing metals.

Northwest products are manufactured on the west coast by—
ALERT SUPPLY COMPANY • Los Angeles

NORTHWEST CHEMICAL CO.

9310 ROSELAWN

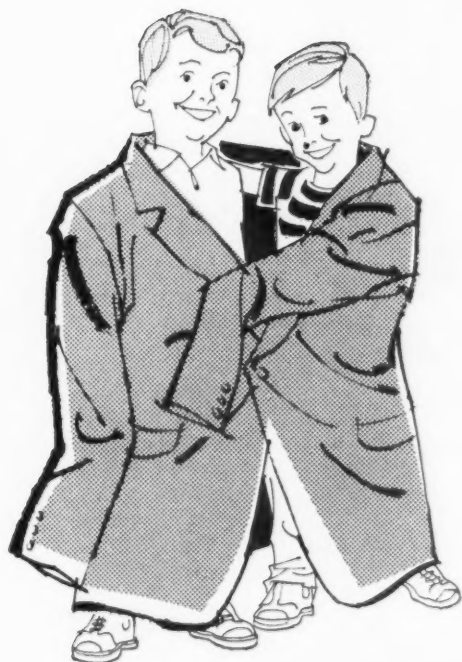
DETROIT 4, MICH.

pioneers in pH cleaning control

serving you since '32



One coat does the job of two with Lowe Feuzon



Here's another example of what can happen when one of Lowe Brothers finishing engineers understands your problem. Check this engineer's report:

"The paint department foreman said that it was necessary to apply 2 or 3 coats for good coverage — especially when the metal had dark spots. He tried an order of Feuzon Gray Metallic and found it covered beautifully with one coat. When he has used up the competitive material in stock, he'll order our Lowe Feuzon."

Lowe Brothers finishing engineers are trained to find ways to cut painting costs. They're experts on paints and finishing methods. Your nearby engineer will gladly make a "flow-chart" analysis of your finishing system. No obligation. Just send the coupon.

LOWE BROTHERS

INDUSTRIAL FINISHES

QUALITY UNSURPASSED SINCE 1870



Style-tested paints for Home and Industry

REPRESENTATIVES IN: Chicago, Ill.
Boston, Mass. • Jersey City, N. J.
Cleveland, Ohio • Pittsburgh, Pa.
Rochester, N. Y. • Dayton, Ohio
Columbus, Ohio • Milwaukee, Wis.
Indianapolis, Ind. • Cincinnati, Ohio
Detroit, Mich. • Springfield, Mass.
Philadelphia, Pa.



The Lowe Brothers Company
Dayton 2, Ohio

MF-2

☐ Please have my nearest Lowe Brothers Finishing Engineer call on me as soon as possible.

NAME _____

TITLE _____

FIRM NAME _____

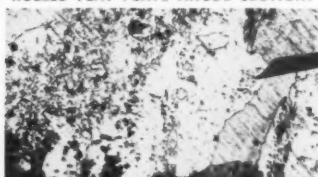
ADDRESS _____

CITY _____ ZONE _____ STATE _____

SHAPED, EXTRUDED ANODES

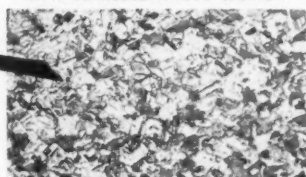


ROLLED FLAT PLATE ANODE SECTION:



This Photomicrograph shows highly irregular, uncontrolled grain size—a major cause of shedding and resultant rough electrodeposits.

APW EXTRUDED ANODE SECTION:



Note small, fully controlled regularity of grain size that promotes uniform corrosion, smoothest electrodeposits, less rejects.

THE GREATEST ANODE DEVELOPMENT IN YEARS

APW Shaped, Extruded Anodes were developed to extend the useful life of our anodes . . . to assure uniform and consistently smooth electrodeposits . . . to minimize shedding. They accomplish these objectives for our customers day after day—and in addition, they have helped to lower plating costs!

The anodes are scientifically shaped to retain 80% of original surface area after 85% by weight has been plated off! You get less polarization and less silver scrap to handle.

The APW Extrusion process provides a definite, identifiable anode shape. They are a complete anode. Be certain of your service. Our service is your particular. We are glad to

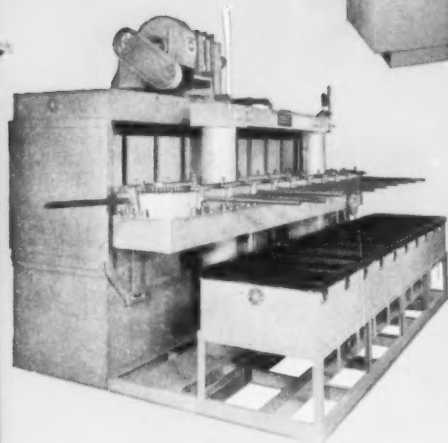
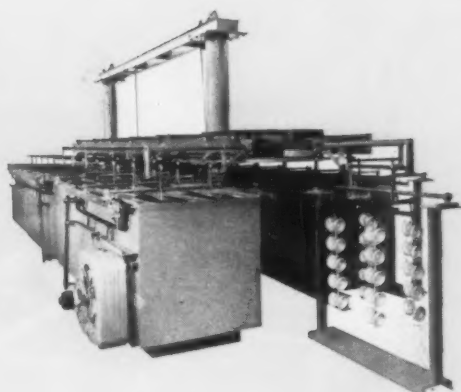
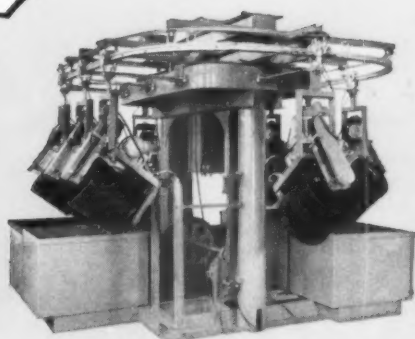


THE AMERICAN
231 NEW JERSEY RAILROAD AVENUE
NEWARK, NEW JERSEY

ENGELHARD

INDUSTRIES

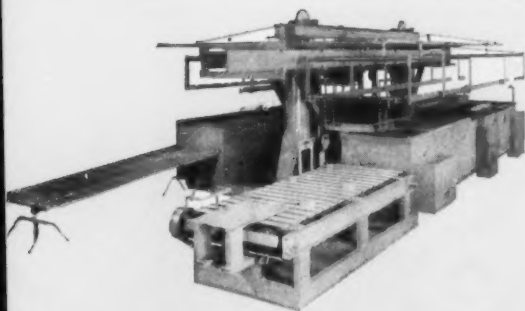
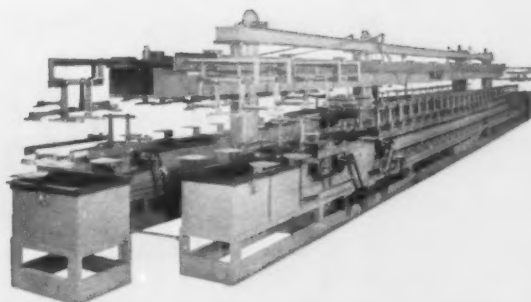
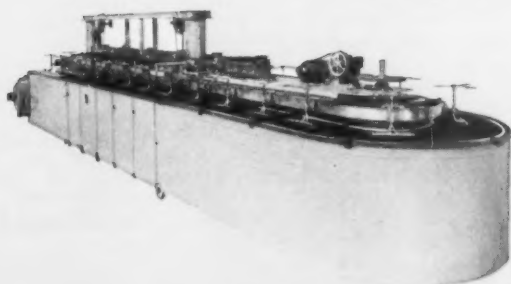
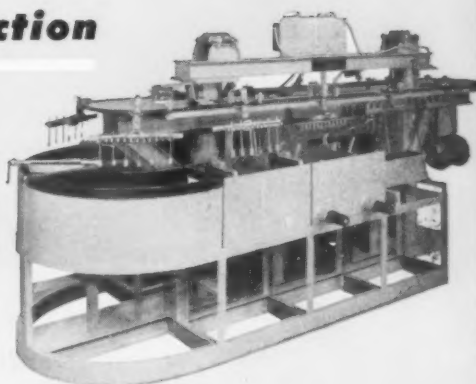
CROWN AUTOMATICS



increase production

reduce costs

improve quality



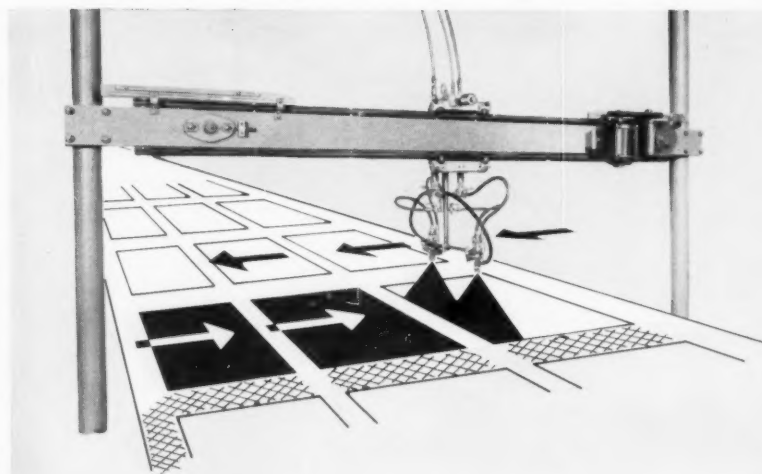
Crown Automatics are ideal for plating your barrel or racked work. Crown manufactures the widest variety of fully automatic plating machines in the industry... there is a model to fit your needs. Write us details of your job and production requirements.

CROWN RHEOSTAT AND SUPPLY COMPANY

3465 N. KIMBALL AVENUE • CHICAGO 18, ILLINOIS

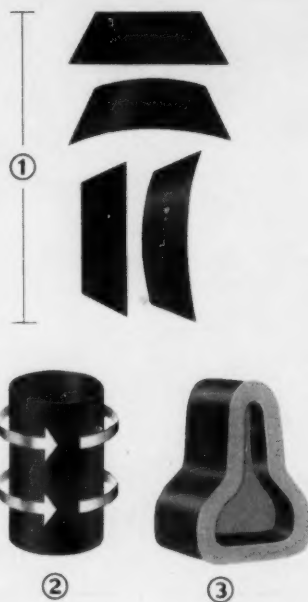
DeVilbiss Automatics...

a cost-saving answer to coating problems



DeVilbiss Automatic Spray Machines, in three basic types, feature speed of application and uniformity of finish not possible by any other coating method. (1) Automatic Transverse Machines coat flat or contoured shapes on hori-

zontal or overhead conveyors. (2) Automatic Rotary Machines spray all types of small shapes with ultra-fast drying material. (3) Automatic Chain-On-Edge Machines spray all types of irregular shapes inside and out.



**You can increase rate of production,
improve quality of your work,
and reduce costs
to fraction of manual methods!**



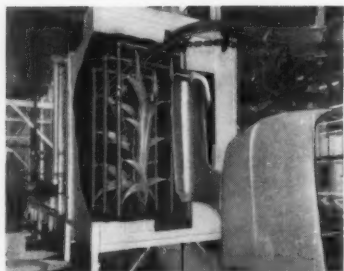
THE DEVILBISS COMPANY, Toledo 1, Ohio • Barrie Ontario • London, England • Branch Offices in Principal Cities

Complete mechanization with DeVilbiss Automatics eliminates variation of manual operation and boosts production—in many cases 500% or more.

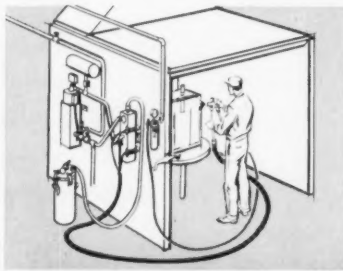
Gun positions are precisely set to coat your product quickly, uniformly, with accurate lapping and minimum overspray.

This precision means greater uniformity of spray-applied film; assured uniformity of color, luster, and texture of finish. Use of materials is carefully established and maintained; rate of production is constant.

What's more, you can know in advance whether automatic painting is practical. We will test-run your product in the DeVilbiss Laboratory without charge or obligation. Call our nearest branch office; or write us direct for Series I-8000 Bulletins on automatic spraying.



Newcomb-Detroit Flo-Coaters. Save manpower and floor space in prime- or single-coat applications. Write, stating requirements.



DeVilbiss Hot Spray. Provides heavier film build, with faster drying, less overspray, and fewer rejects. Send for Bulletins IE-114 and F-286.



DeVilbiss Fluid Hose. Unsurpassed for resistance to solvents, oils. Flexible, kinkproof. Full line of connections. Send for Catalog IE-E.

OFHC[®] COPPER

And anodes made of OFHC copper are produced only by American Metal Climax.

OFHC stands for **Oxygen Free High Conductivity** copper. OFHC copper is the only oxygen-excluded copper—it is not deoxidized copper.

Plating with OFHC Copper Anodes therefore means:

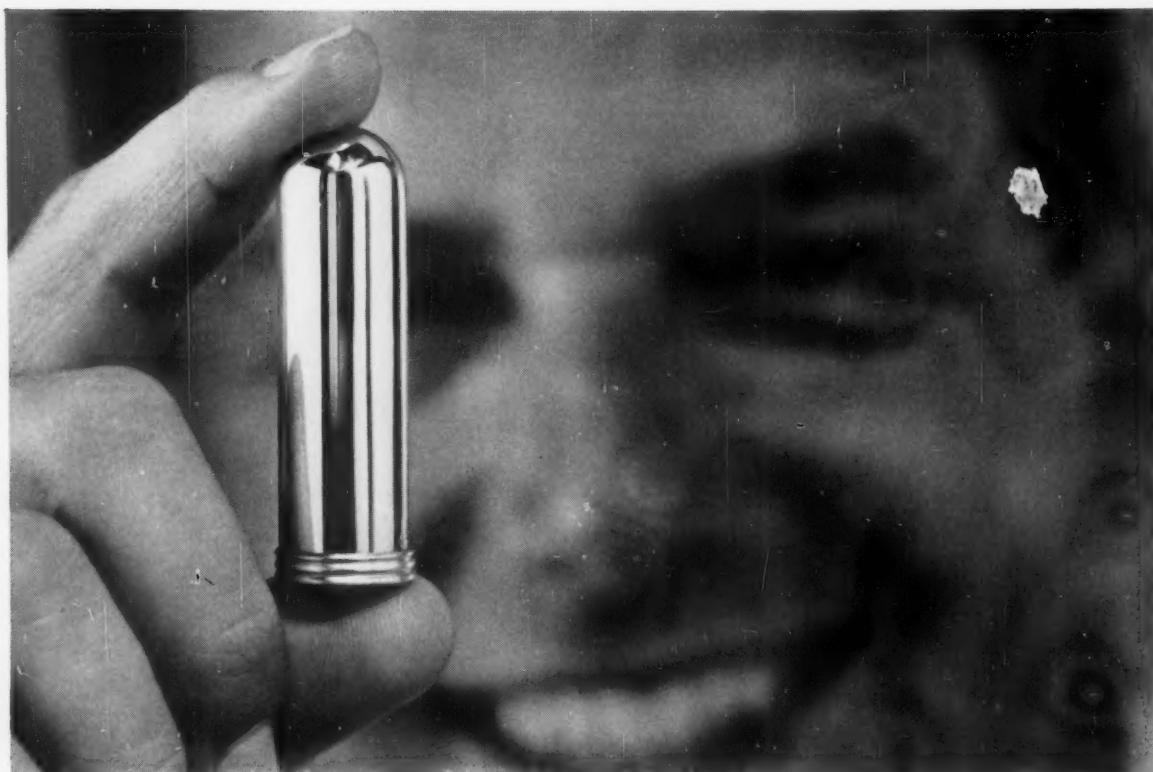
- more usable copper per anode •
- smoother finishes •
- product uniformity •
- no bags or diaphragms •

Technical assistance and additional information available upon request.

Metal Sales Department
AMERICAN METAL CLIMAX, INC.
61 Broadway, New York 6, N. Y.



ONLY AMERICAN METAL CLIMAX MAKES IT



This part finished better, cost less when degreased with NIALK® TRICHLORethylene

What do you do when a part that's supposed to be bright and glossy comes out of the vapor degreaser dull—tarnished—unacceptable for finishing?

This was the problem facing The Plume & Atwood Mfg. Co., Thomaston, Conn.

Plume & Atwood manufactures pen caps, pen barrels and lipstick cases by the million to their exceptionally rigid quality specifications. But the high luster buffed into these parts was being lost in the degreaser. Tarnished spots suddenly started to show up, making a good coating job impossible.

(This is a fairly common problem in vapor degreasing. It's caused by the solvent you use turning acid. Solvent can go sour rapidly—unless it's protected by a neutral stabilizer that doesn't lose strength.)

Plume & Atwood tried several different conventional degreasing solvents, without success. Results were "inconsistent"; solvent life was much too short. To keep the bath from going sour, P and A

had to dump and clean out the degreaser every three weeks.

Solved...with NIALK

Then P and A switched to NIALK TRICHLORethylene. Result: immediate improvement. The first charge of NIALK solvent functioned without trouble for nine weeks.

There's no telling how much longer this charge would have continued in service, for at this point P and A installed newer degreasing equipment. Since then, NIALK TRICHLORethylene has remained in service more than six months without once going sour.

As a result, P and A feels that the tarnish problem is solved for good. Parts now come out of the degreaser untarnished and immediately ready for further processing.

"We're getting considerably better solvent mileage," says John Bradford, P and A's assistant to the plant manager, "and much improved gloss and luster at lower

cost—thanks to NIALK!"

Only NIALK has psp

This example shows why you get *more effective, lower-cost* degreasing when you use NIALK TRICHLORethylene with **psp**—*permanent staying power*.

You *never* have to replenish the neutral stabilizer in NIALK. Even after many distillations, it's still there—working to prevent acid formation and other causes of breakdown. You go much longer, and degrease many more parts, between cleanouts. Cleanouts are easier, too, because NIALK actively retards the formation of degradation products in your degreaser.

For better degreasing, do this

See for yourself how you can keep your degreasers operating efficiently with NIALK—long after other solvents have lost their punch. Write us today on your business letterhead for the complete facts, including a resume of comparative metalurgical tests on five leading brands.

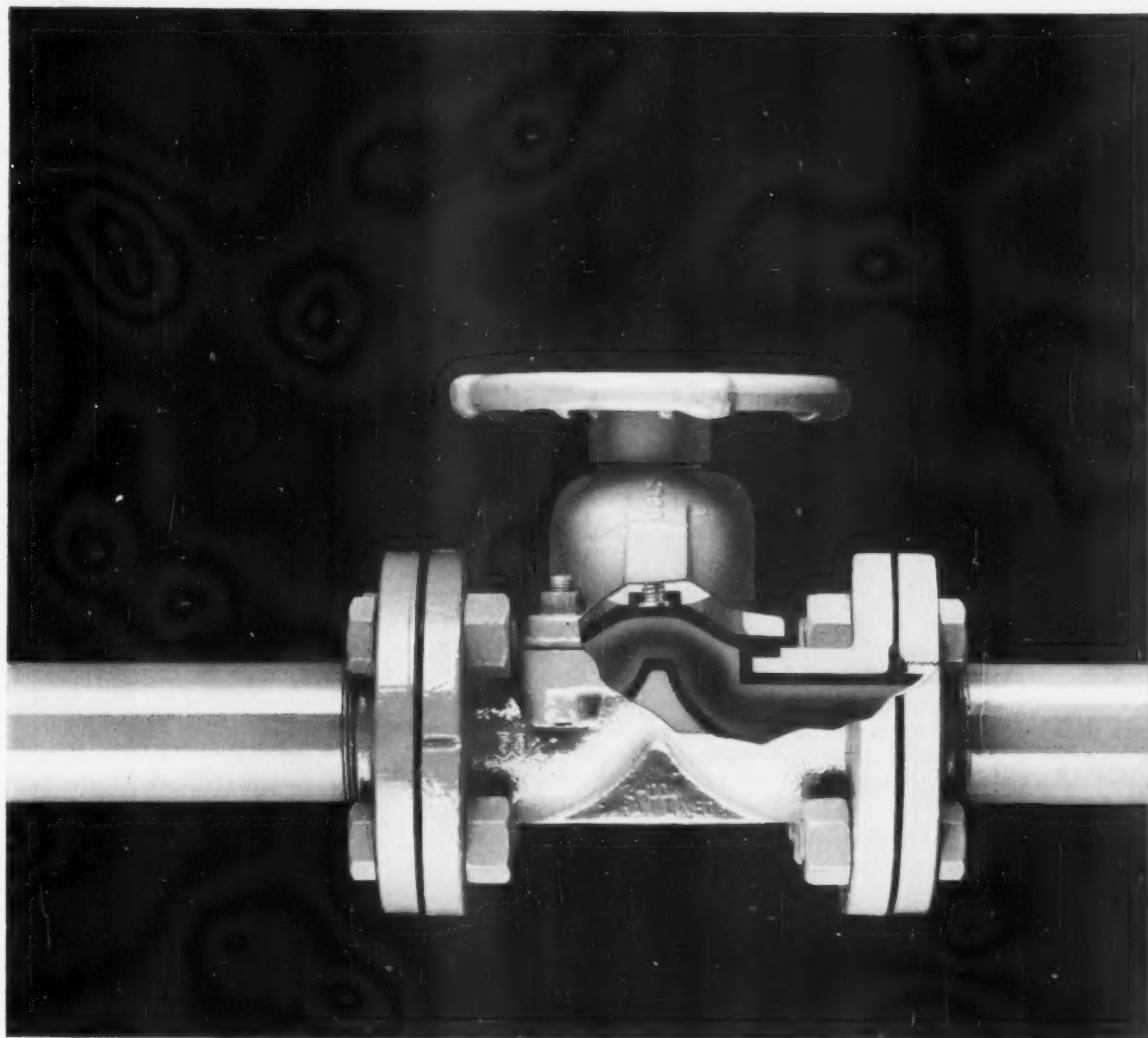
HOOKER ELECTROCHEMICAL COMPANY

1302 Union Street, Niagara Falls, N. Y.



DUREZ® PLASTICS DIVISION • NORTH TONAWANDA, N. Y.
NIALK® CHEMICALS • NIAGARA FALLS, N. Y.
OLDBURY® CHEMICALS • NIAGARA FALLS, N. Y.

Sales Offices: Chicago, Ill.; Detroit, Mich.; Los Angeles, Calif.; New York, N. Y.; Niagara Falls, N. Y.; Philadelphia, Pa.; Tacoma, Wash.; N. Tonawanda, N. Y.; Worcester, Mass. In Canada: Hooker Chemicals Limited, N. Vancouver, B. C.



Corrosion protection is continuous in saran lined pipe—liquid never touches metal.

Here's why Saran lined pipe offers long range economy

*It's rigid steel pipe . . . lined with
corrosion-resistant saran . . . keeps shutdowns to a minimum for years*

Looking ahead? Do your plans call for a complete corrosion-resistant piping system with a low total installation cost . . . a system that requires a minimum of maintenance . . . that's simple to modify . . . that can be fabricated in the field?

Then it will pay you in every way to look into the genuine economy of a complete system of saran lined pipe.

First, consider the natural advantages of the new gray saran lining itself. Its lower coefficient of thermal expansion and contraction more closely approaches that of steel. This provides a broader operating temperature range and greater

resistance to thermal cycling. It can be installed in systems with operating pressures from full vacuum to 300 p.s.i. and temperatures up to 200° F. Add to these advantages the immediate availability of saran lined pipe, valves, pumps and fittings and you have an ideal piping system that can be installed without trouble, waiting or hidden costs.

If your plans call for lined tanks, you'll want the advantages of Saraloy® 898 tank lining added to your saran lined pipe system. Get the complete story on how it will pay you to install a complete saran and Saraloy 898 lined system. THE DOW CHEMICAL COMPANY, Midland, Michigan.

SARAN LINED PIPE COMPANY
DEPT. 2000D-1
2415 BURDETTE AVENUE
FERNDALE 20, MICHIGAN

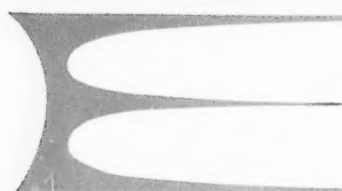
Please send me information on:

- ☐ Saran lined pipe, fittings and valves.
☐ Saran lined centrifugal pumps.
☐ Saraloy 898 chemical-resistant sheeting.

Name _____ Title _____ Company _____
Address _____ City _____ State _____

YOU CAN DEPEND ON

DOW



PRODUCT NEWS

Don't judge the cost of a cleaning process by solvent or chemical costs alone

Du Pont's new Cost Analysis Service can help you determine total costs . . . the only realistic basis of comparison

It's easy to draw misleading conclusions about the comparative costs of vapor degreasing and wet cleaning by comparing only the cost of trichlorethylene versus alkali chemicals. Such conclusions can result in a costly mistake when choosing a metal-cleaning process. *Invoices tell only part of the story!*

Du Pont has initiated this new cost-analysis service to help you find out what your metal cleaning is now

costing, or, in the case of expansion or new installations, to help you determine the most efficient and economical process. Based upon sound accounting principles and 25 years of Du Pont "know-how" in metal cleaning, this service reveals the *total* cost of your operation. All cost factors are considered, including utilities, maintenance and depreciation, labor and the important item of "return on investment."

This Du Pont service can save you real money—in your present operation, or in the consideration of new or replacement equipment. Example: in a plant operating 7 degreasers, over-all cleaning costs appeared out of line. Changes adopted as the result of a Du Pont survey paid off in savings of \$3,000 to \$6,000 per degreaser.

GET ALL THE FACTS about this informative, cost-saving service. Just ask your local distributor of Triclene® D trichlorethylene, or send us the coupon at right, below.

* * *



DU PONT TECHNICAL MAN points out for visitor how thoroughly grease is removed from metal part suspended in model degreaser. Glass sides of degreaser enabled visitors to see entire process.

Du Pont booth at Metal Show featured Model Degreaser

Visitors to the recent Metal Show in Chicago saw "Triclene" D trichlorethylene in action. They learned how quickly and thoroughly the vapor-degreasing process works and heard about Du Pont's new cost analysis. If you missed the show and are interested in learning more about vapor degreasing and/or Du Pont's Cost Analysis Service, just send us the coupon at right.

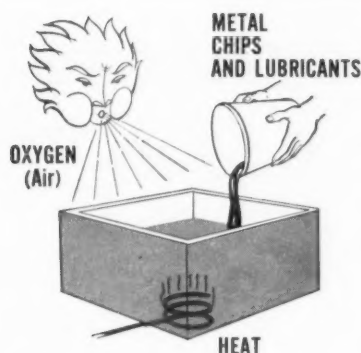
How's your supply of "Tri"?

Check your supply of trichlorethylene and be sure you won't be caught short during peak work loads. If you're low, better give your local distributor of "Triclene" D a call. He's well equipped to handle your orders promptly and efficiently.



BETTER THINGS FOR BETTER LIVING
... THROUGH CHEMISTRY

FOR MODERN METAL CLEANING



*Completely stabilized
against breakdown*

TRICLENE® D
Trichlorethylene

**assures fewer degreaser
cleanouts**

You can count on brighter, cleaner work and easier, less frequent degreaser cleanouts when you use "Triclene" D.

"Triclene" D contains special stabilizers to protect the solvent against the major deteriorating influences present in modern metal-cleaning operations . . . fatty acids, sulfur-bearing lubricants, oxygen, heat and metal chlorides. These stabilizers, in turn, are backed by a neutral acid acceptor. All of these stabilizers are designed to remain in the solvent indefinitely through distillation after distillation.

The stabilizers in Du Pont "Triclene" D do not combine with fatty acids and other contaminants to form sludge. This is your assurance that your degreaser will maintain peak operating efficiency with fewer, easier cleanouts.

Try Du Pont "Triclene" D and find out for yourself how "full-time" stabilizers make the difference!

New \$2 million Du Pont Laboratory will help solve your metal-cleaning problems

In April 1958, the facilities of Du Pont's new Sales Technical Laboratory will provide extra support for the services now offered by your local distributor of "Triclene" D and your Du Pont Technical Representative.

This modern laboratory will have the latest conveyerized production-line vapor-degreasing equipment, including an ultrasonic unit . . . all equipment needed to research problems encountered in both large and small units, hand-operated or mechanized.

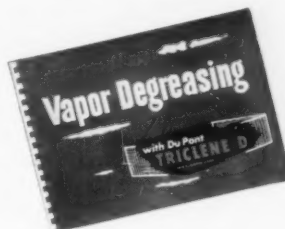
Accurate metering devices will make it possible to pinpoint utility costs and to determine solvent losses for all types of production operations. Customers' actual plant conditions can be duplicated and evaluated against norms established at this new laboratory. Actual and theoretical operating costs can be compared.

Ask your Du Pont Technical Representative for further details about this new laboratory—the finest of its kind—soon to be ready to help you!



NEW LABORATORY contains 25,000 sq. ft. of floor space and will contain full-scale equipment for demonstration and customer service.

FREE VAPOR-DEGREASING BOOKLET
tells you how vapor degreasing works, shows types of equipment, points out many cost-saving advantages. Just mail the coupon below for your copy.



ELECTROCHEMICALS DEPARTMENT
Chlorine Products Division

E. I. DU PONT DE NEMOURS & CO. (INC.)
Wilmington 98, Delaware

☐ Please send more information on your new cost analysis service. MF-2
☐ Please send me your booklet on vapor degreasing.
☐ Please have your representative call for an appointment.

Name _____ Position _____
Present method of cleaning _____
Firm _____
Address _____
City _____ Zone _____ State _____



A new high-speed cyanide copper plating process

DU PONT is now offering a new copper process for plating steel parts and zinc die castings. This new bath has been thoroughly field-tested, and is producing high-quality results on automobile bumpers and grilles, hardware products and wire.

In addition to high-quality results, you get these other advantages with Du Pont's new high-speed copper-plating process:

Low maintenance cost—An inexpensive cyanide electrolyte is used that is easily maintained with Cyanobrik®

sodium cyanide or Du Pont high-purity potassium cyanide.

Simplicity—Only two new addition agents are needed. The first is Elchem 1396 which sequesters organic contamination and, by promoting smooth anode corrosion, assists in the production of smooth deposits. The other new addition agent—Elchem 1393—greatly increases the bright plating range of the bath and serves as a brightener.

Low use-cost of addition agents—means Du Pont's new Copper Plating Process is *economical* as well as effective.

Consistent, easily-controlled performance—Day-to-day performance is highly uniform—even after shutdowns. Use of the two addition agents—which are stable in the bath—contributes to this trouble-free operation.

Your existing high-efficiency copper bath can probably be converted to the new Du Pont plating process with minimum disturbance of production. For the complete story on this new high-quality copper-plating process, write or use the coupon on the next page.



Test bumper guards are removed from laboratory experimental copper plating bath. New Du Pont Process gives bright, smooth coatings at higher current densities.

A new plating chemical... sodium copper cyanide double salt... is manufactured by Du Pont specifically for make-up and maintenance of copper-plating solutions formulated with sodium cyanide. Advantages: facilitates make-up and replenishment of plating solution, cuts handling of chemicals, eliminates error in bath make-up and replenishment. Check and return coupon for more information.



BETTER THINGS FOR BETTER LIVING
... THROUGH CHEMISTRY

FOR MODERN METAL PLATING

Cyanobrik® sodium cyanide gives you extra-high purity, safety and convenience

YOU can count on outstanding results when electroplating with "Cyanobrik" sodium cyanide. It's a high-purity product whose uniform quality is assured by the production techniques used at Du Pont's modern new plant in Memphis, Tenn.



Just a twist of a wrench is all it takes to unlock the full-open-head drums used to ship "Cyanobrik." Note the absence of sharp or ragged edges. And "Cyanobrik" drums are reclosable—an important feature from Du Pont that can save you money when storing unused contents.

Just look at these specifications for "Cyanobrik":

Sodium cyanide	96% minimum
Sodium chloride	0.2% maximum
Sulfides (as sulfur)	0.0005% maximum

Yet, as this typical analysis shows, Du Pont delivers an even higher-quality product:

Sod. cyanide	97.5%	Sod. formate . . .	0.35%
Sod. hydroxide . . .	0.4%	Sod. chloride . . .	0.1%
Sod. carbonate . . .	1.5%	Water	0.15%
Sulfides (as sulfur) . . .	0.0004% (4 ppm)		

This extra-high purity means you can always depend on Du Pont "Cyanobrik" sodium cyanide for your plating jobs—including the most critical.

For your extra safety and convenience—Du Pont "Cyanobrik" is shipped in full-open-head drums. There are no exposed or ragged edges when opening or closing drums. The reclosable-drum feature is a Du Pont specialty and provides full protection for the unused contents.

"Cyanobrik" itself is made in the form of 1-ounce, pillow-shaped briquettes. These uniformly sized briquettes are convenient for measuring small quantities. Dusting is minimized, and accidental spillage can be cleaned up quickly and safely.

Another extra—Du Pont service

Du Pont's plating experts—backed up by a fully equipped Sales Technical Laboratory—are always ready to provide on-the-spot service. It's a money-saving advantage you get when ordering sodium cyanide from Du Pont—a reliable domestic supplier—always close at hand.

Call your nearest Du Pont sales office or check and return the coupon.

ELECTROCHEMICALS DEPARTMENT
Sodium Products Division

E. I. DU PONT DE NEMOURS & CO. (INC.)
Wilmington 98, Delaware

MF-2

Please send me information and literature on: ☐ New Copper Plating Process
☐ Cyanobrik® sodium cyanide ☐ Sodium copper cyanide double salt

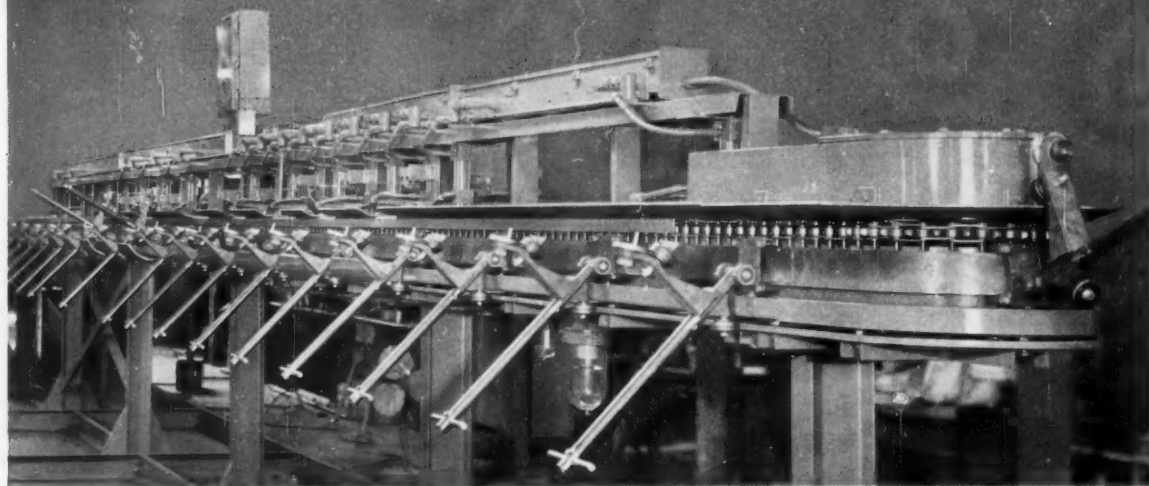
Name _____ Position _____

Firm _____

Address _____

City _____ Zone _____ State _____

HANDLE 2, 3, OR MORE PROCESS CYCLES
ON ONE MACHINE *At One Time!*



LASALCO'S *Select-O-Matic*

MULTIPLE PROCESS PLATER

Another Lasalco development that offers the industry the last word in *fully automatic* plating!

With the new Select-O-Matic, the operator simply selects the desired process cycle for individual racks, when loading the machine, merely by turning a dial on the carrier. From that point, the rack *automatically* travels through the entire selected cycle without further attention.

A single Select-O-Matic plater, manned by one

operator, will handle several various processes simultaneously. Different machines for each process are eliminated—original investment in equipment is greatly reduced—much less floor space is needed—maintenance is cut to an absolute minimum.

The Select-O-Matic is easily adaptable to any operation. Tell Lasalco about *your* operation and requirements to learn what this new machine can do for *your* production and profits.

Write Today!

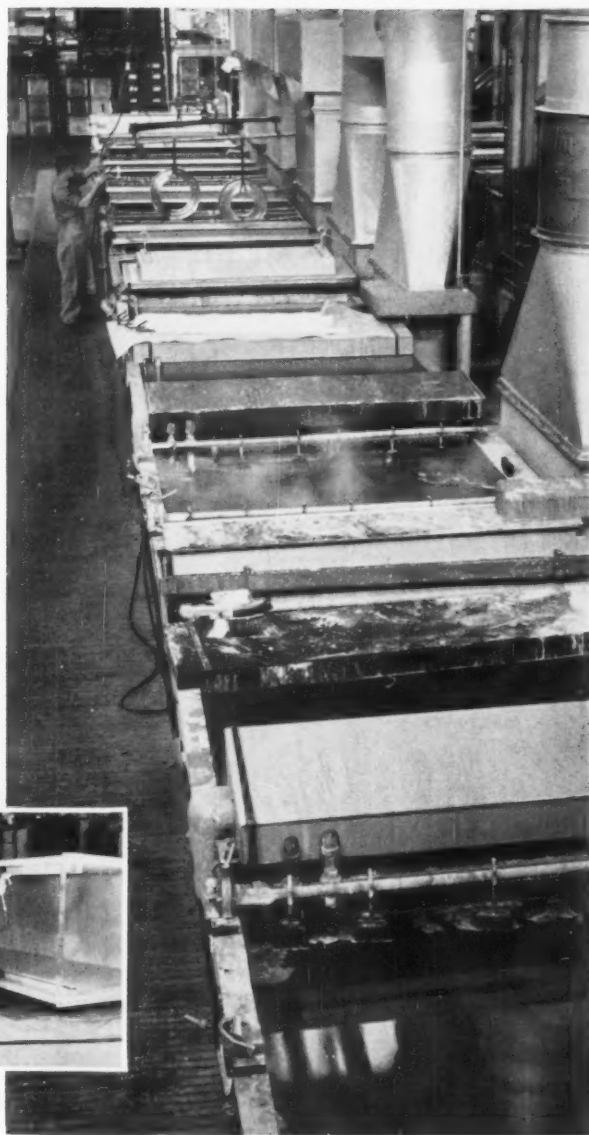
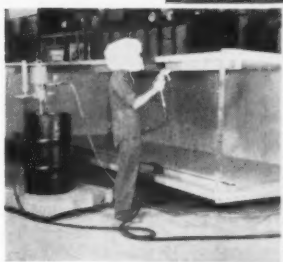
LASALCO, INC.

HOME OFFICE: 2820 LaSalle St. • St. Louis 4, Mo. • PRospect 1-2990
IN TEXAS: 2805 Allen Street • Dallas, Texas • RiVerside 7-5814

Unichrome® "Super 5300" plastisol saves tanks and money

Lined with Unichrome Plastisol, the tanks at right are a few of hundreds made fit for a wide variety of plating and cleaning operations in one plant.

Sprayable "Super 5300" builds up thick vinyl film which blocks penetration of corrosive solutions. Large tanks fabricated in sections can be coated and then bolted after lining. Plastisol coating on tank exteriors (easily applied during lining) ends need for subsequent painting during plant maintenance.



...sprays seamless, pore-free protective coatings thick as sheet linings

MORE AND MORE plating plants are specifying Unichrome Plastisol instead of sheet lining for their tanks. One company, in fact, now has over 1000 cleaning and metal finishing tanks not only lined with this remarkably durable material, but "lifetime" coated on exteriors as well.

Such acceptance proves that Unichrome Plastisol protection *pays* . . . that it provides a completely *reliable* lining.

Unichrome "Super 5300" Plastisol sprays films of up to 60 mils thick per coat. Multiple coats build up thick as plastic or rubber sheets, deliver more dependable protection because they conform to irregular surfaces without air pockets or seams. They also cost less to apply.

The thick plastisol films have good flexibility and abrasion resistance to absorb mechanical abuse without harm. Should the coating be damaged, even years

later, it can still be patched good as new.

Unichrome Plastisol securely seals tanks against corrosion, protects solutions from contamination. An acid and alkali resisting vinyl coating, its chemical inertness makes tanks more versatile . . . interchangeable for a wide variety of work.

Unichrome Plastisols are available in black, gray, green. Firms ready to coat *your* tanks and equipment are in key locations. Ask for names, or for Bulletin SP-1.



First name in plastisols for all plating purposes

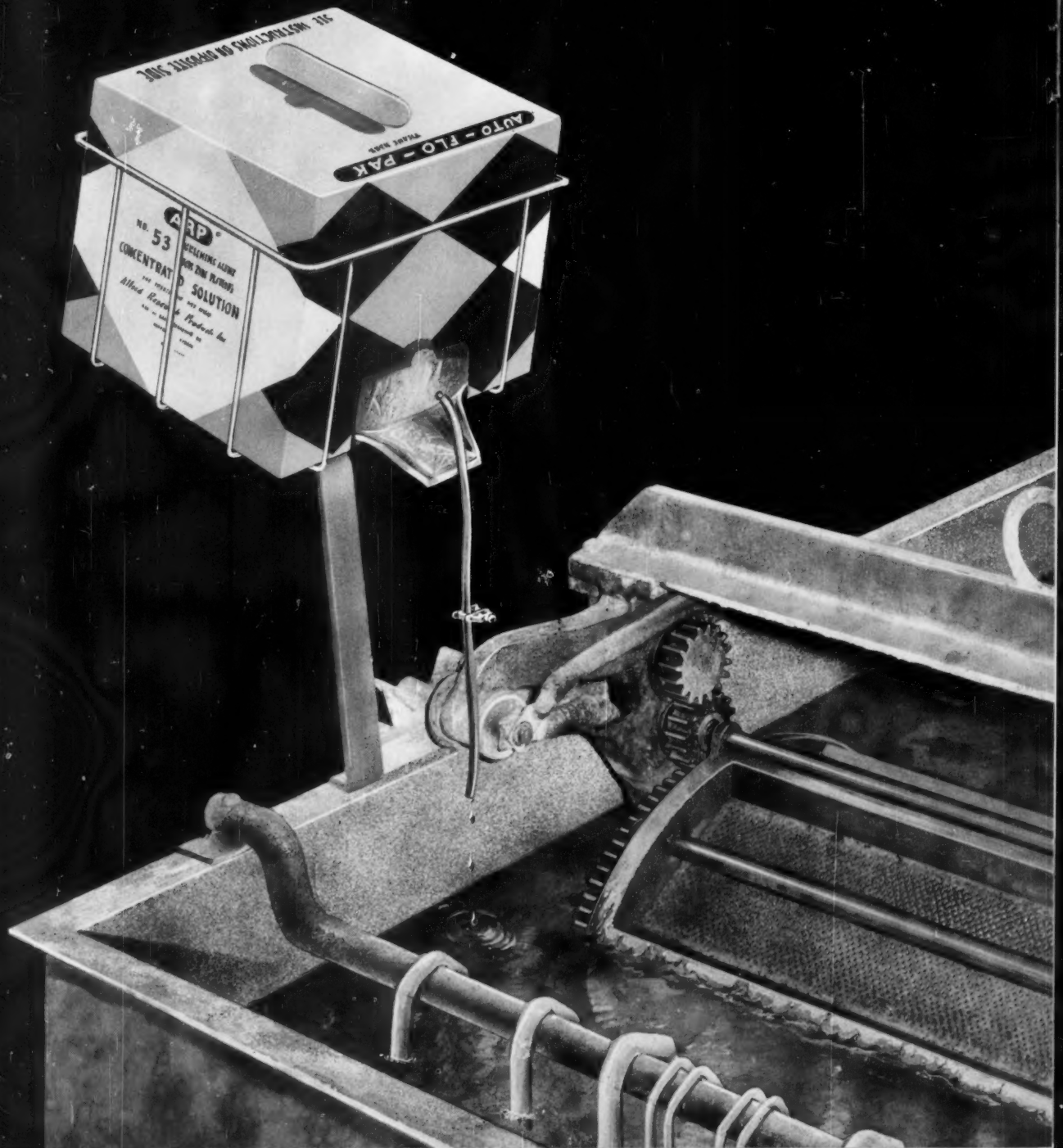
METAL & THERMIT
CORPORATION

GENERAL OFFICES: RAHWAY, NEW JERSEY

Pittsburgh • Atlanta • Detroit • East Chicago • Los Angeles

In Canada: Metal & Thermit—United Chromium of Canada, Limited, Rexdale, Ont.

NOW, GET DIAMOND-BRIGHT ZINC



& CADMIUM PLATING *Easier with*

1—Revolutionary **AUTO-FLO-PAK** for Liquid Brighteners

TRADE MARK

Provides accurate, steady, automatic feed for more uniform plating, lower plating costs. When used with easy-to-set-up Auto-Flo Dispenser, you get:

AUTOMATIC MAINTENANCE OF PROPER BRIGHTENER LEVEL—This amazing AUTO-FLO-PAK and new brightener dispensing method require only a single setting to assure a constant, peak-efficiency, uniform flow of brightener. There's no danger of adding too little or too much . . . no waste, no muss, no bother.

MORE UNIFORM BRIGHTNESS, MORE UNIFORM PLATE—Each part you plate gets the full effect of brightener as it is fed into the solution . . . helps produce a uniform, diamond-bright plate throughout the entire run.

The AUTO-FLO-PAK consists of a specially designed one-gallon polyethylene container in a cardboard carton. It is designed for use in conjunction with the Auto-Flo Dispenser, consisting of a wire mounting rack and feed tube. The Auto-Flo Dispenser is available from Allied. For those who prefer to pour a specified amount of liquid brightener into the plating solution, the AUTO-FLO-PAK has a handy pouring spout on the top and a measuring window on the side.

The ready-to-use AUTO-FLO-PAK, 6 to a case, is easier to handle and gives better inventory control. You can tell at a glance what you have in stock . . . and

you release just the right amount to your production line. The AUTO-FLO-PAK takes up less storage space and can be easily lifted on and off shelves.

The Auto-Flo Dispenser with the adjustable feed tube assembly provides absolute and positive brightener flow control. Once you set it, you forget it . . . and you automatically and constantly get maximum brightness, efficiency and economy. There's little chance of wasting any brightener. The Auto-Flo Dispenser is easily attached to any tank . . . does not interfere with plating operations.

2—New, Low-Cost **ARP** #53 Liquid Brightener

A great new Liquid Barrel Zinc Brightener that gives you:

LOWER PLATING COSTS—ARP 53 is not only low in purchase price but low in operating costs.

LONGER LIFE—ARP 53 has excellent stability at high temperatures . . . also after shut-downs of the plating bath.

DIAMOND-BRIGHT FINISH—ARP 53 gives bright plate over a wide range of current densities in barrel plating. ARP 53 maintains excellent throwing power and reaches deep recesses easily with uniformly bright deposits . . . provides ideal plated surface for clear bright or colored Iridite coatings.

EASE OF USE—Like all ARP brighteners, ARP 53 is 100% organic in nature, easy to put into use and gives immediate results.

MORE GOOD NEWS FOR ZINC AND CADMIUM PLATERS!

ARP 31 for rack zinc plating and ARP 41 for all cadmium plating are also available in the convenient new AUTO-FLO-PAK . . . at slightly higher prices to cover special packaging.

SPECIAL INTRODUCTORY OFFER!

As a special introductory offer, we'll send you one Auto-Flo Dispenser at a special price of \$4.40 with your first order for ARP 53, ARP 31 or ARP 41 in the AUTO-FLO-

PAK, 6 to a case. Additional Auto-Flo Dispensers are available at regular price of \$8.80. This offer expires MAY 31, 1958, so clip coupon, fill out and mail today.

PLEASE SEND ME:

_____ cases of ARP 53 (9 lbs. per AUTO-FLO-PAK) @ \$.75 lb. \$40.50 per case.

_____ cases of ARP 31 (10 lbs. per AUTO-FLO-PAK) @ \$1.02 lb. \$61.20 per case.

_____ cases of ARP 41 (8 lbs. per AUTO-FLO-PAK) @ \$.64 lb. \$30.72 per case.

_____ also send me Auto-Flo Dispensers at \$4.40 each.

_____ I would like more information of ARP # _____ and the AUTO-FLO-PAK.

NOTE: Special price on Auto-Flo Dispenser applies only to the first case order on each brightener.

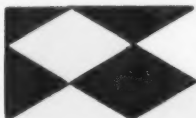
Please send me _____ extra Auto-Flo Dispensers at \$8.80 each.

COMPANY _____

STREET _____

CITY _____ ZONE _____ STATE _____

Order Authorized by _____



Allied Research Products, Incorporated

4004-06 E. MONUMENT STREET

BALTIMORE 5, MARYLAND

Manufacturers of

Iridite Finishes for Corrosion Protection and Paint Systems on Non-Ferrous Metals; ARP Plating Chemicals

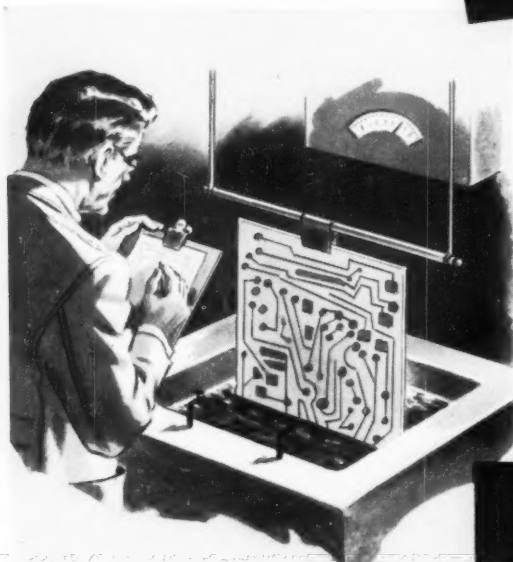
West Coast Licensee — L. H. Butcher Co.

Specialists in  the Unusual

SINCE 1901

Rhodium

ELECTROPLATING SOLUTIONS



Technological knowledge acquired through many years of experience, plus special processes and equipment, assure the high quality of our Rhodium Plating Solutions.

Recommended for contact surfaces of switches, waveguide parts and other electrical applications, such as printed circuits...Can be applied in extremely heavy deposits, up to 100 milligrams per square inch.

Rhodium plating provides the advantages of whiteness, lustre and corrosion resistance of a precious metal.

Consult our staff, without obligation,
about your specific plating problems.

SIGMUND COHN MFG. CO., INC.

121 SOUTH COLUMBUS AVENUE • MOUNT VERNON, NEW YORK

56/Circle on Readers' Service Card

Another **fine** product made **finer**

with the PARAMOUNT "Finishing Touch"

"To achieve a fine finish on beautiful sterling silver flatware, you start with a smooth, uniform surface," says Gorham Mfg. Co., leading silver- and goldsmiths. "To eliminate major defects in the metal before final finishing, we've found that the most efficient method is to use Paramount Felt Bobs with a mixture of fine pumice and oil. Paramount felt wheels and bobs are ideal for polishing flatware and holloware. Easily formed and having an affinity for pumice and oil, they produce a better surface than any other buff."

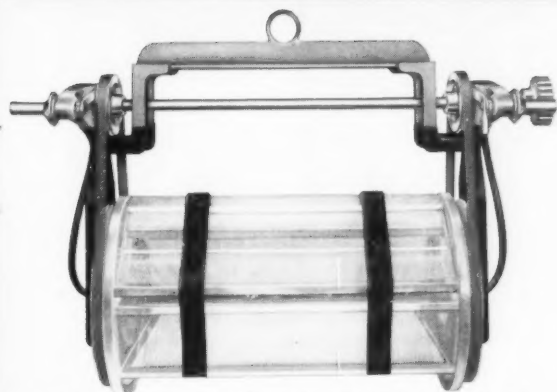
For fine, basic finishes, quality manufacturers depend on Paramount Wheels and Bobs. Join the leaders—specify Paramount. Call your supply house today!

Paramount
Felt Wheels,
Bobs, Sheet Felt



Bacon Felt Co. 437 West Water St., Taunton, Mass.

the NEW STUTZ COMPLETE CYCLE BELT DRIVEN PLATING CYLINDER



MODEL A

- NO CYLINDER GEARS • NO CYLINDER BEARINGS
- LOWEST POSSIBLE MAINTENANCE
- HIGHEST POSSIBLE CURRENT

These units are the result of our experience with industry and service plating. The belt design has now proven superior to gear driven types, and with outboard mounted driving pulleys, belts can be changed if necessary, in seconds without tools. In addition to our own equipment these units made to fit all makes of plating tanks and furnished also with motor drives mounted directly on cylinder superstructure. Cylinder current horns are heavy copper alloy and are sized for either four or three horn saddle contact. Cathode contactors are dangle type, others available. Standard sizes 14"x30" and 14"x36" (I.D.) 12 additional sizes from 12"x24" to 18"x42" (I.D.) Standard perforations 3/32" round on 3/16" centers. Special dual openings for processing of extremely small parts available.

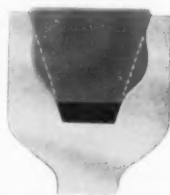


This design incorporates cylinder pulleys separate and smaller from the cylinder head. The hanger arms are semi-steel castings protected with 5/16" thick special vulcanized hard rubber.

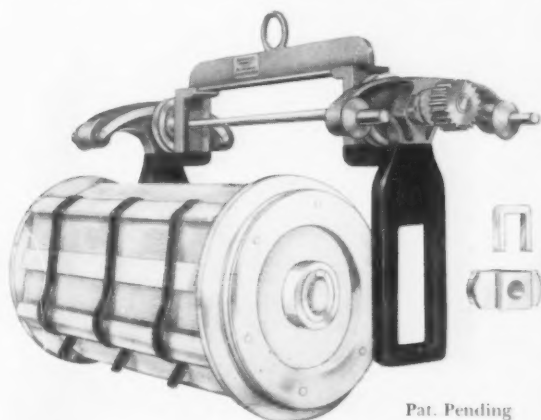
Specially designed counter pulleys of monel metal or plexiglas with deep dimples for positive grip against belt face.

Pat.
Pending

This shows the belt expanding into the dimples of the driving pulleys. This action provides positive pull with no abrasion to the belt whatsoever.



Simply lifting the top piece vertically from the dangle holder, allows the holder to be withdrawn through the hanger slot. This releases the cylinder from the hanger.



Pat. Pending

STUTZ PORTABLE PLATING BARREL

★ Baskets in perforated metals or wire mesh

★ Load/Unload Stand for convenient and fast handling of work load

The Stutz Portable Barrel is made in 2 standard sizes with cylinders having inside dimensions of 6"x12", 8"x18" and 10"x18" I.D. Smaller upon application. Standard openings are 3/32". Smaller or larger openings can be furnished as required.

Write for Catalog and Prices

We Invite Your Inquiries



THE **STUTZ** COMPANY
4430 West Carroll Ave., Chicago 24, Illinois
Complete Metal Finishing Equipment and Supplies

Here's an aluminum ...reduces maintenance costs...

...MIL-



Ordinary caustic solution causes build-up of scale on tank interior. Scale must be chipped off frequently.



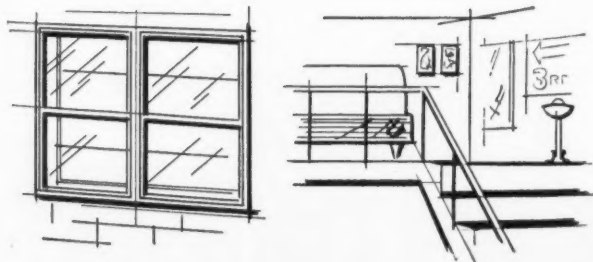
New Wyandotte Mil-Etch suspends dissolved aluminum in solution. No scale develops throughout entire life cycle.

Here's a brand-new caustic-type aluminum etchant that eliminates expensive shutdowns, needless maintenance and labor costs. Mil-Etch keeps dissolved aluminum in solution—prevents it from forming a hard scale that must be chipped from tank walls.

Etches rapidly and uniformly. Economically concentrated, Wyandotte Mil-Etch produces an attractive, uniform, high-quality etch in only a few minutes on aluminum extrusions, wrought sheets and bar stock. You can also use Mil-Etch for deep etching or chemical milling of aluminum alloys.

Easy to use. Mil-Etch is nondusty, will not cake

Use Mil-Etch for



METAL FINISHING, February, 1958

etchant that eliminates scale produces a bright matte surface

ETCH!

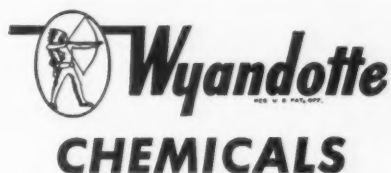
in drums; also, no excessive foam or fumes. You can use a tank of Mil-Etch until it becomes "loaded" with dissolved aluminum. Tank dumping is simple — just pull the plug!

Desmutting. For brightening aluminum alloys that turn dark in alkaline etching processes, try Wyandotte 2487. It is safer than ordinary acid solutions, and permits a closer control of the desmutting bath. Being in easy-to-handle granular form, solution make-up and additions are simple.

For full information on how new Mil-Etch and Wyandotte 2487 will solve your aluminum-etching problems, call your Wyandotte representative.

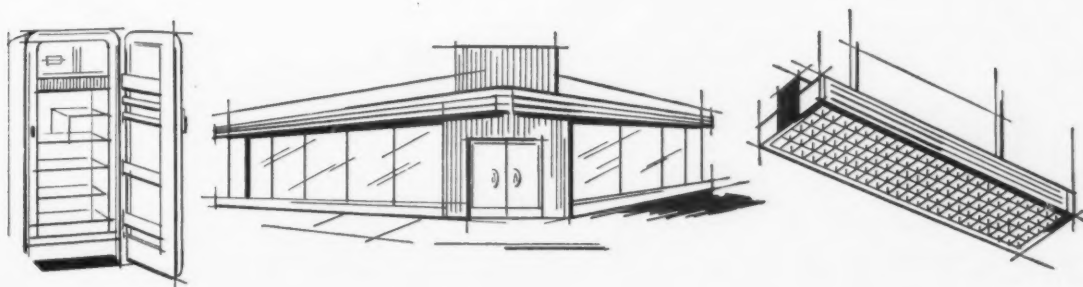
*Wyandotte Chemicals Corporation, Wyandotte, Mich.
Also Los Nietos, Calif. Offices in principal cities.*

**THE BEST IN CHEMICAL PRODUCTS
FOR METAL FINISHING**



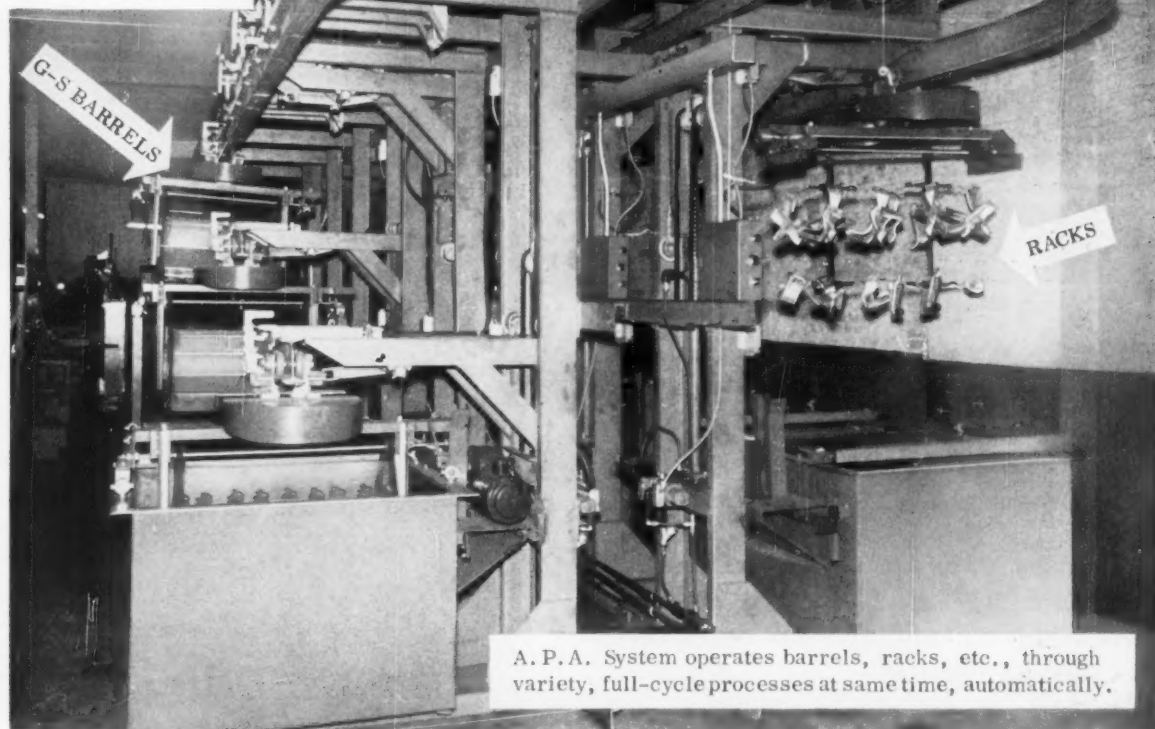
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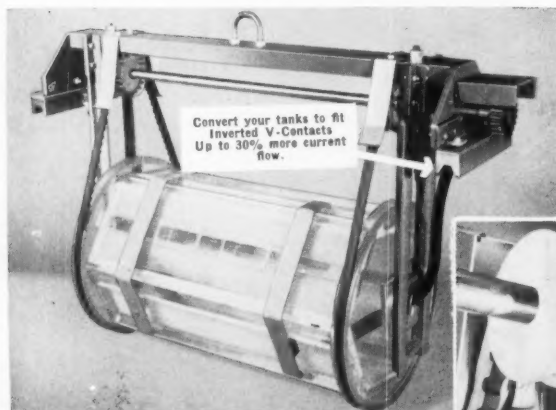




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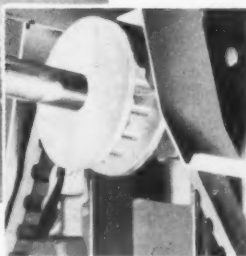
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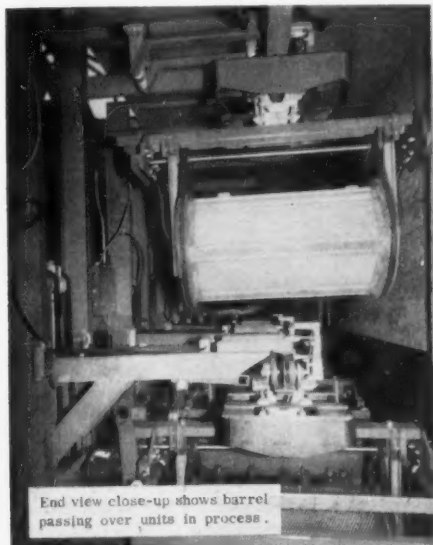
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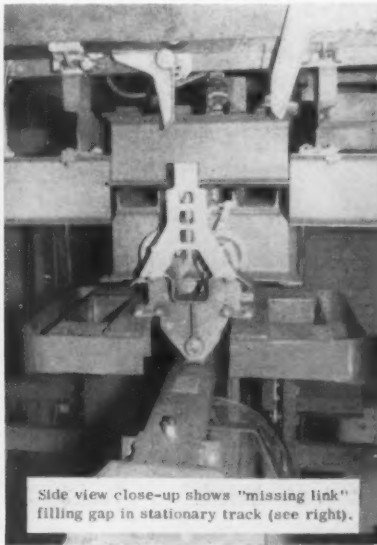
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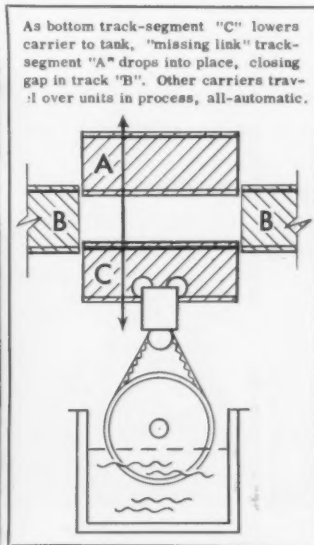
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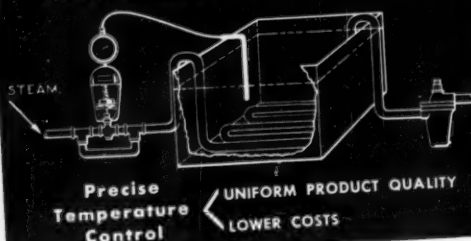
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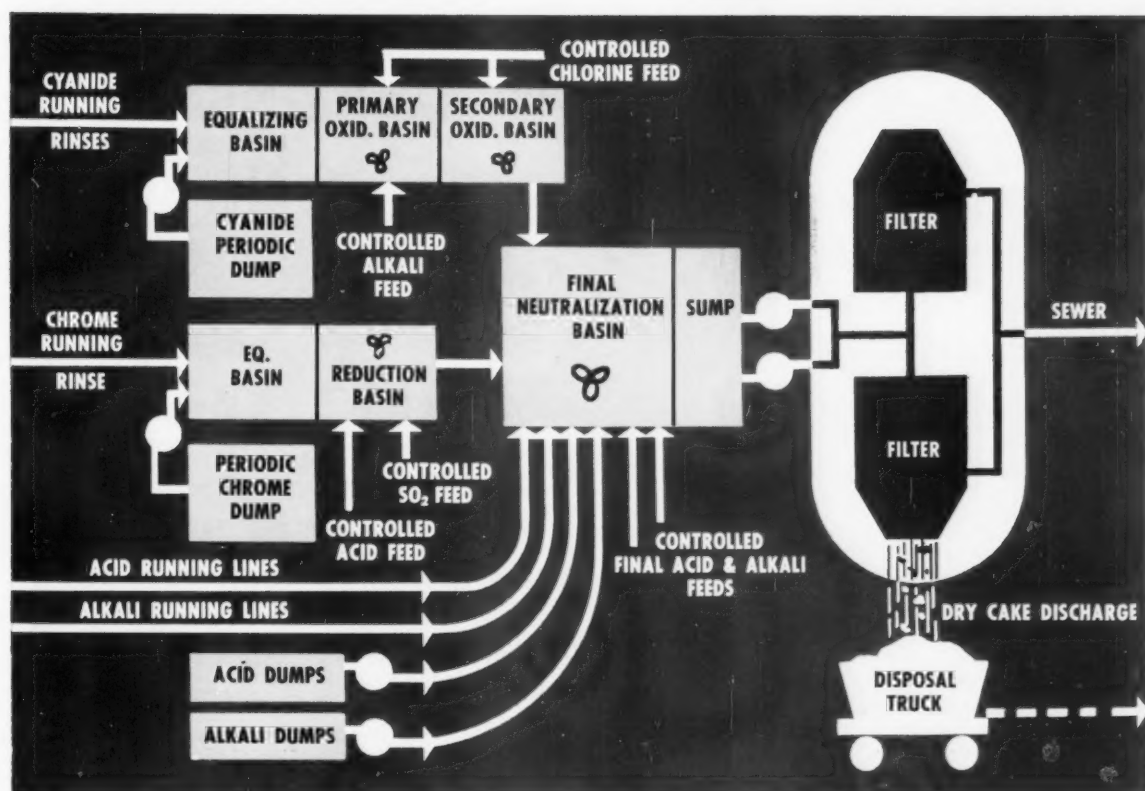
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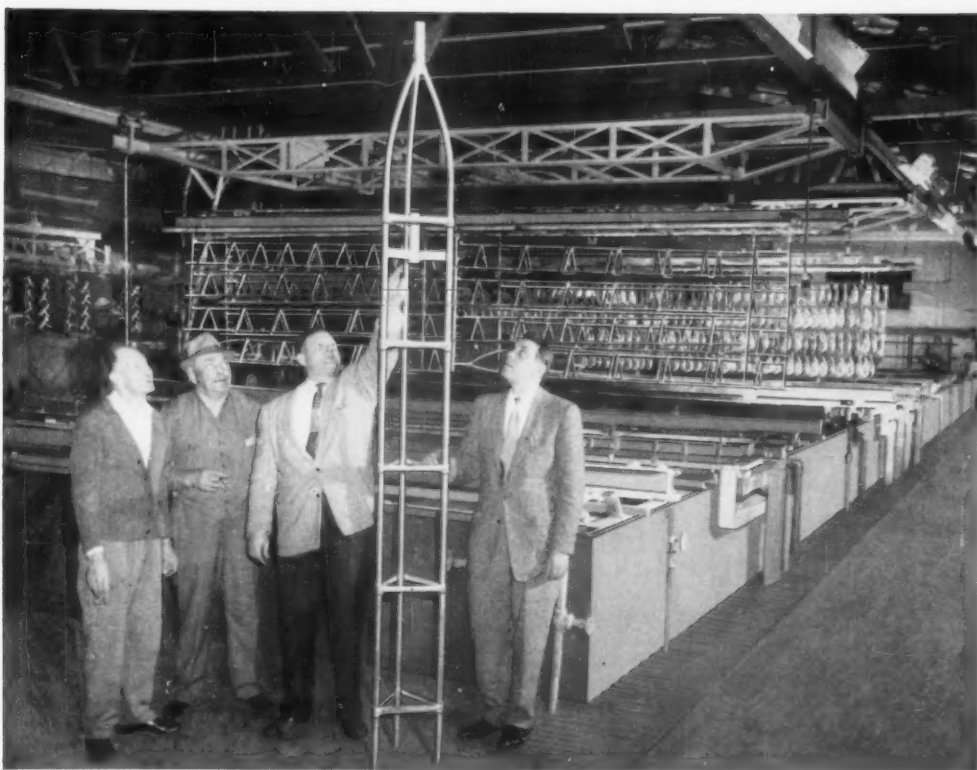
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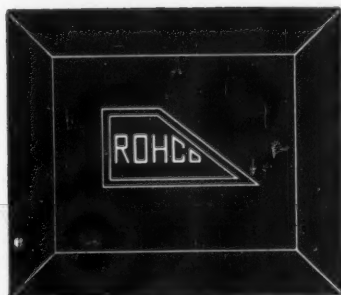


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FEBRUARY, 1958

Volume 56 Number 2

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Published Monthly By
Finishing Publications, Inc.

Established in 1903 as Metal Industry by Palmer H. Langdon 1868-1935.
381 Broadway, Westwood, N. J.
Westwood 5-1530

L. H. Langdon, *President-Treasurer*; Palmer H. Langdon, *Publisher*; Thomas A. Trumbour, *General Manager*; Joan T. Wiarda, *Sales Manager*; Nathaniel Hall, *Technical Editor*; Daniel A. Marino, *Asst. Tech. Editor*; Fred A. Herr, *Pacific Coast Editor*; John E. Trumbour, *Equipment & News Editor*; Inez Oquendo, *Assistant Editor*; Elizabeth Meyers, *Circulation Manager*.

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SUBSCRIPTION INFORMATION

United States and Canada \$5.00 per year, other countries \$10.00. Single copies 65c in United States and Canada, other countries 85c. GUIDEBOOK-DIRECTORY 26th edition 1958 current, 680 pages 5 1/4 x 7 7/8, subscriber's edition \$2.00 per copy, deluxe edition \$3.50 per copy. Please remit by check or money order; cash should be registered. Request for change of address should reach us on or before the 15th of the month preceding the issue with which it is to go in effect. In sending us your change of address, please be sure to send your old address as well as the new one. It is difficult and often impossible to supply back numbers. Copyright 1958 by Finishing Publications, Inc. All rights reserved. Contributed articles, letters on pertinent subjects are invited. Their publication, however, does not necessarily imply editorial endorsement. Re-entered as second class matter June 13, 1940 at the post office at New York, N. Y. under the Act of March 3, 1879.



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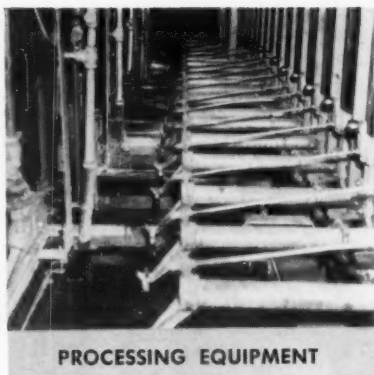


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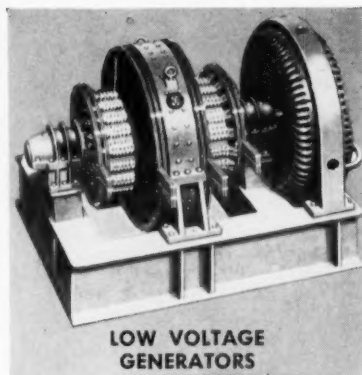
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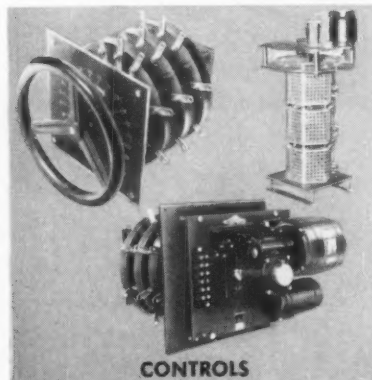
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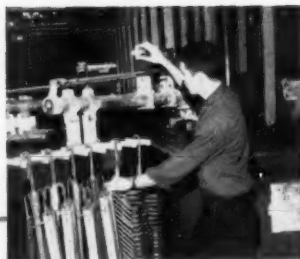


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Organic Finishing and the Plater

Your editor once spent a whole month spray lacquering gold plated phonograph tone arms way back when they were sported by all high-priced, spring-wound phonographs, which may enable some of the old-timers to pinpoint the era. We will only admit that it was before the late and unlamented depression. In those days, platers knew two kinds of lacquer, the water-white nitrocellulose type which we used for silver plate, and the slightly yellow-tinted gum type which was suitable for copper and brass. Anything with a pigment was called "enamel."

We all know that advances in organic coating technology have not lagged behind other fields, but too many platers *have* lagged behind in familiarizing themselves with modern practice in this phase of finishing. It is not by necessity, but by choice, that they have remained uninformed of these advances and, through association with these men over the years, we have reached the conclusion that they have been afraid to become involved in what they consider the field of organic chemistry. Since the education and experience of most practical platers have not included the subject of organic chemistry, their attitude is understandable. But, it is also misguided!

Let's consider what the plater should know about organic finishing. It isn't at all necessary to know the chemical formula or the method of manufacture of an epoxy or phenol-formaldehyde resin in order to understand their desirable characteristics, as evidenced by coatings in which they are employed. It will suffice for him to learn what advantages the different types offer, their proper application to obtain optimum results and, last but not least, what *not* to expect of them. One does not have to be an organic chemist to appreciate the difference between wet and dry film thickness, to know that some coatings become brittle and others yellow with age or heat, and to be aware of differences in moisture permeability.

The feature articles and the announcements of new developments in organics which will appear in METAL FINISHING, will be for the finisher, not for the chemist. Many supervisors today are responsible for both departments and it is the rare plater who will serve out his career without becoming involved with organic coatings. Defects blamed on improper plating have been traced to the organic finishing department, and vice versa. If not for improving his opportunities for advancement, then in self-defense, the plater should keep up-to-date by adding this subject to his field of interest.

Nathaniel Hall

Thickness of Lead Deposits

Measurement by Means of Beta Rays

By Gunner Gabrielson and Kurt Ljunggren, *Dept. of Physical Chemistry, Royal Inst. of Technology, Stockholm, Sweden*

Theory

WHEN β -particles from a radioactive source impinge on a surface they will be absorbed or scattered by the atoms in the material. The intensity of the scattered β -radiation will be largest in the forward direction from the source but scattered radiation is also present in the opposite direction. This back-scattering is not a reflection in the optical sense since the reflection does not take place in the surface layer but is a volume phenomenon. The intensity of this back-scattered radiation increases with the thickness of the scattering material up to a certain saturation level. This saturation occurs when the reflecting layer is about half the thickness of the β -particle range in the material. The back-scattered intensity is also dependent upon the

scattering material in such a way that the saturation level increases with increasing atomic number in the reflector. Empirical work¹ has shown that the back-scattered intensity varies as Z^n , where Z is the atomic number of the reflector and n is a constant with a value of 0.7-0.8.

When a thin coating of a material A is plated on a material B, the thickness of B being enough to cause saturation back-scattering, the back-scattering is intermediate between that corresponding to the pure materials A and B. The intensity of this back-scattered radiation is dependent upon the thickness of the coating A and is, therefore, a measure of the thickness, if the condition mentioned is fulfilled. The greatest sensitivity and accuracy in the determination of thickness of

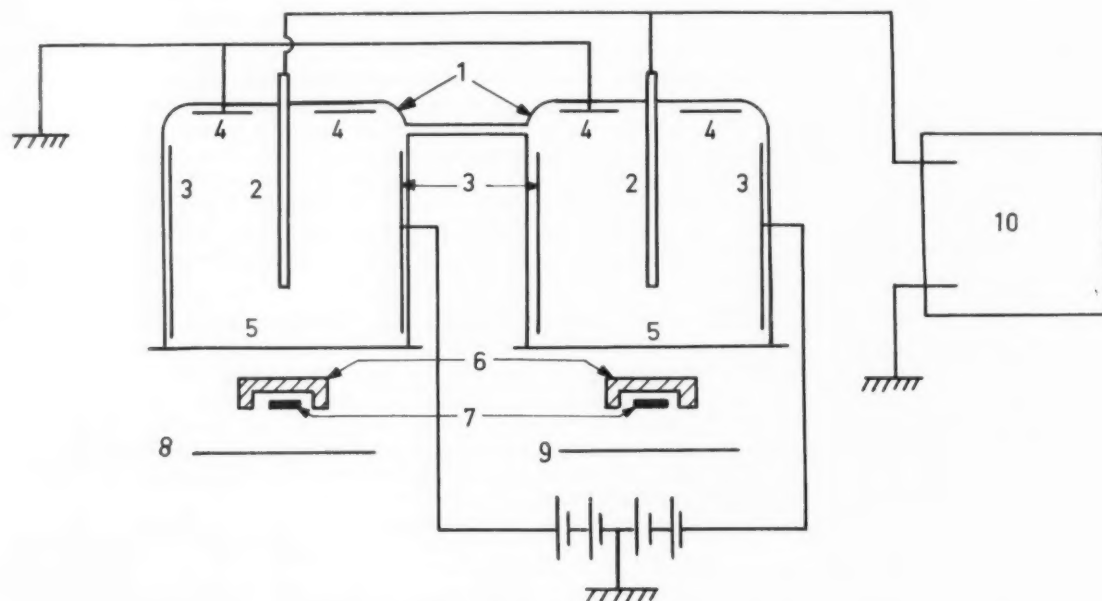


Figure 1. Apparatus for Thickness Measurements.

- | | |
|---|-----------------------------------|
| 1. Bell-type glass ionization chambers. | 6. Radiation shields. |
| 2. Inner electrodes. | 7. Radioactive sources. |
| 3. Outer electrodes. | 8. Lead-plated copper test sheet. |
| 4. Guard rings. | 9. Standard reflector. |
| 5. Thin aluminum windows. | 10. Vibrating reed electrometer. |

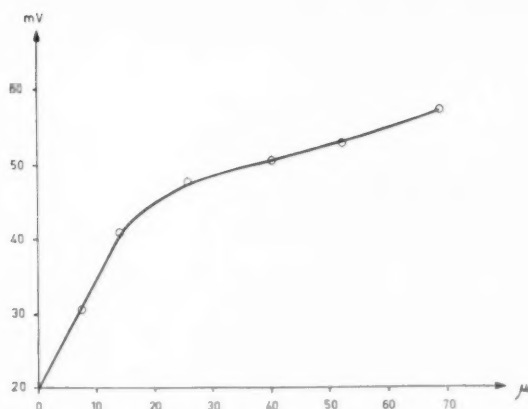


Figure 2. Voltage as a function of lead deposit thickness.

galvanic coatings by means of back-scattered β -radiation will be achieved when the difference between the atomic numbers of the coating and the basis metal is large. This means that the determination of lead plated on relatively light metals, e.g. copper, is very favorable.

Experimental

Lead-plated copper specimens 10 x 10 x 2 mm were employed for the experiments. The lead was deposited from a fluoborate bath of ordinary type under carefully controlled conditions, in order to obtain a uniform thickness on the whole area, avoiding the build-up of thicker deposits at corner and edges. The copper specimens were accurately weighed before and after plating and the mean thickness of the lead coating was calculated from the area of the specimen. The thicknesses of the coatings were 7.3 μ , 14.0 μ , 25.5 μ , 39.9 μ , 52.2 μ and 63.5 μ .

The specimens were measured in a setup which is schematically shown in Figure 1. The intensity of the radiation scattered back from the specimen enters an ionization chamber through a thin aluminum window. The radioactive source microcuries (^{90}Sr — ^{90}Y) is shielded to prevent the direct radiation from reaching the chamber. The ionization produced by the β -particles in the chamber gives rise to a current between the electrodes when a voltage (130 V.) is applied. This current is opposed to the current from a twin chamber with an identical radioactive source and a standard back-scatterer. The chambers are air-filled and connected with a glass tube, in order to obtain the same pressure in both. The difference in output from the chambers is measured by means of a vibrating reed electrometer², with an input resistor of 5×10^{10} ohms. Full scale deflection on the voltage range used (100 mV) corresponds to a current difference of 2×10^{-12} amp., which is above the sensitivity limit of the instrument used for these experiments with a factor 10^3 .

Each of the six test specimens was measured several times. The reproducibility was tested by means of new measurements after a period of several days. It was also confirmed that readjustment of the electrometer had no effect on the results.

Results and Discussion

The results of the thickness measurements are seen

from Figure 2, where zero thickness corresponds to pure copper. The curve in this figure has a somewhat complex shape which is probably due to the presence of two overlapped β -spectra in the radiation from the source used. The sensitivity is highest for lead thicknesses below about 25 μ (0.001"). The relative error for the determinations, estimated from repeated measurements, in no case exceeds 5 per cent with a measuring time of about 20 sec.

The sensitivity and precision in these measurements do not, in any way, represent the ultimate limit of the method. The sensitivity can be improved by the use of a weaker β -radiation, although the range in which coating thicknesses can be assessed will decrease. The precision for a given measuring time will be better with the use of a stronger radioactive source.

Applications

As has been stated in the theoretical treatment above, the method of measuring thicknesses of metallic coatings by means of back-scattering of β -rays is more accurate the larger the difference is between the atomic numbers of the coating and the basis metal. As lead has a very high atomic number the method, therefore, is very suitable for determining the thickness of a lead deposit on most common metals, e.g. iron and copper. Of course, lead coatings on iron may also be determined by magnetic methods but, for measuring lead coatings on copper, which is very important in lead-acid battery manufacture where copper connections are usually lead-plated, the back-scattering method at present seems to be the most simple and reliable one. Also, in the determinations of tin deposits on iron or copper the method should be very suitable, as tin also has a rather high atomic number.

A very great advantage of the back-scattering method lies in the fact that it is readily applicable to the control of continuous plating operations, e.g. in continuous strip-plating plants for lead or tin plating on iron or copper sheets and strips. In this case the plated sheets, after washing and drying, pass the measuring device shown in Figure 1, where the thickness of the deposit is continuously measured. Of course, it is possible to automatically record the results obtained.

The general requirements for thickness measuring methods in manufacturing control are well-known. In applying these requirements to the back-scattering method described in this paper the following conclusions are reached. The method is more accurate than most methods used, and is fast and simple to perform. Moreover, it is non-destructive and very suitable for continuous control. The cost of the equipment is not too high, although probably more expensive than the apparatus commonly used today. And, finally, the method is applicable to many types of coatings, the only requirement being that the atomic numbers of the coating and the basis metal are not too close. Because of these many attractive features, the back-scattering method seems to be very suitable in the metal finishing field.

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Gold - Dyed Aluminum Used in Russian Watches

By A. J. Steiger

RUSSIAN watch makers are using dyed aluminum to produce gold-colored alarm clocks and wrist watches, the Moscow trade press reported recently. From a business standpoint, according to the report, since these clocks and watches look like the real article, the first lot to reach the Russian jewelry stores were eagerly bought up by consumers who obviously preferred them to the same models in chromium plate. The elements of the process used at the Moscow watch factory, first plant in the USSR to master mass output of the imitation gold watches, were described in *Priborostroyeniye* (Instrument-Making), a monthly technical production journal of the Russian precision instrument industry.

Aluminum strip with a mirror finish is essential, and lustre must be retained both in the process of anodic oxidation and during subsequent dyeing. Proper selection of metal is important. The alloy must be absolutely free of iron, manganese, and copper. To facilitate machining, up to one per cent magnesium and silicon are present in the alloy used at the Moscow watch factory. Preliminary heat treatment gives the aluminum blanks a suitable hardness. Watch parts of such aluminum resist deformation well, are easily worked with diamond and hard-alloy cutters and, finally, will accept a mirror finish.

After being machined, parts are mounted on racks and immersed in an alkaline solution of the following composition:

Caustic soda	10 g./l.
Trisodium phosphate	50 "
Sodium silicate	30 "
Temperature	50-60°C.
Time	3-5 minutes

Anodic Treatment

To remove the film deposited during cleaning, the parts are dipped in nitric acid having a concentration of 300 g./l., after a careful rinsing in hot and cold water.

Electrolytic polishing is then performed to give the parts a suitable lustre. This process requires 2 to 5 minutes in a solution containing 80 per cent orthophosphoric acid and 20 per cent ethylene glycol, at an anode current density of 12 to 24 amp./sq. in. and

temperature of 90 to 100°C. Strict watch must be maintained to prevent the current density falling too low, since corrosion of the polished surface may result.

After the electrolytic polishing, the parts are immediately and carefully washed in running water, and then subjected to anodic oxidation in a 15 per cent solution of sulphuric acid at 15 to 20°C., with an anode current density of 0.8 to 1.0 amp./sq. in. and a voltage of 12. Oxidation requires 15 minutes, and the oxide film attains a thickness of 8 to 10 microns (0.0003-4"), with 15 per cent porosity.

After anodizing, the parts are again carefully washed in cold distilled water and then subjected to dyeing. Dyeing requires 3 to 15 minutes at 20 to 25°C. and, on completion, the parts are once more rinsed in distilled water and the dyed oxide film sealed by boiling at 100°C. for 30 minutes in distilled water. If it is desired to intensify photostability, sealing is carried out in solutions of 2 to 5 g./l. lead acetate, copper sulfate, zinc chloride, or chromium sulfate, also at boiling.

The next operation is drying in a drying cabinet at 60 to 70°C. for 10 to 15 minutes, and finally the coating is inspected.

After the oxide film is sealed, parts having threads are oil treated, by immersion for 5 minutes in a 5 to 10 per cent solution of pure lanolin in gasoline or toluene, heated to 60°C. The parts, after removal from the solution, are dried in air until complete volatilization of the solvent takes place. This processing improves operation of threaded connections and rubbing surfaces.

Unsatisfactory dyeing of parts is corrected by removing the dyed oxide film in a mixture of chromic anhydride and orthophosphoric acid at 80 to 90°C., after which all operations beginning from alkaline cleaning are repeated."

In the choice of dyes, the Russian report states, the chief requirement is that the dye must not only give the parts the gold color desired, but must also be sufficiently photostable. The acid azo dyes containing metal give the oxide film the most photostable and finest color. Orange dye for nitro-lacquers, the acid orange, and the acid black dyes are used. To create a color that matches best the tone of natural gold, the black

(Continued on page 64)

NEW JAPANESE HARD CHROMIUM PLANT

We are indebted to Yoshio Hirasawa, President, Aikoku Plating Industry Works Ltd., Tokyo, Japan, for supplying the data and photos for this article, and to Marv Rubenstein for its preparation.—Ed.

THERE are more than two thousand electroplating firms in Japan, employing well over 30,000 workers. Three-quarters of these are job shops, the remainder manufacturers, with a large portion of production being done on machinery for the textile industries and on bicycle parts. Though most plating installations and techniques may be considered 'old fashioned' by U. S. standards, there are a number of modern shops making use of bright nickel, bright zinc, and other recent advances. In these firms can be found plating baths for most of the conventional metals now being plated.



Yoshio Hirasawa

Until last year, however, there was no shop capable of hard chromium plating large, heavy machinery components, such as plastic and textile rollers, or drying rolls for a paper mill. Aikoku Plating Industry Works Ltd. of Tokyo, was in an ideal situation to undertake such an installation, since the firm has had over ten years of successful hard chromium plating



Pouring outer shell of reinforced concrete for new heavy-duty hard chromium plating tank. Wooden forms and supporting structure are seen in foreground.

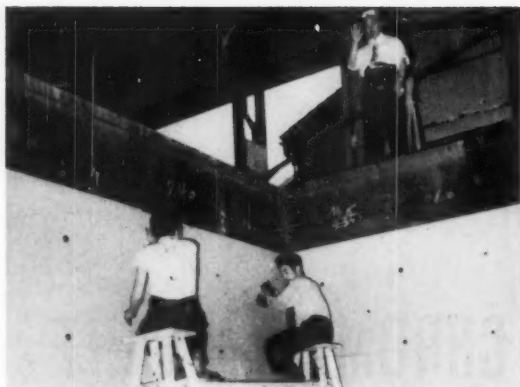
experience on smaller components. Consequently, the firm recently constructed a new building and installed a 22,500 gallon chromium tank, large enough for full immersion of components up to ten feet long by ten feet in diameter. This tank has been in operation for the past year with great success.

Aikoku Plating Industry Works was founded more than 25 years ago as a general job shop. Since 1945, the firm has increasingly specialized in hard chromium plating. Today, virtually all of its work is in this category, with the exception of a small amount of nickel and copper plating. The plant consists of 18 buildings on more than two acres of ground. There are 67,850 square feet of available floor space on which, prior to the installation of the new large tank, there were twenty plating tanks, totalling 44,500 gallons of solution, and 15 auxiliary and spare tanks, totaling 12,000 gallons. Most of these are hard chromium solutions of various sizes and shapes, designed to accommodate a wide variety of different types of work. For example, there is one 15 foot tank for long, straight rods or pipes of small diameter, and there are two spare 45 foot tanks, intermittently used for long items with special shapes.

D. C. current for use with the above is provided by 24 rectifiers and generators, giving a total of 85,000 amperes. The polishing department includes 42 lathes, grinders, polishers, and buffers, with many special machines designed for polishing both plane and curved



Main office and factory, including new building housing 22,500 gallon hard chromium tank.



Lining steel tank with 3/16" thick hard polyvinyl chloride sheets, which are then seam-welded together.

surfaces to a high luster mirror finish. There are also facilities for chemical polishing and for electropolishing, where required. A 32 horsepower boiler provides steam for heating the solutions. Since much of the work handled is heavy and bulky, necessary auxiliary equipment includes a 50 ton ground track, three 25 ton cranes, one 3 ton crane and four 1 ton cranes.

New Tank Installed

To make the above mentioned installation complete so that it could handle parts of almost any size or shape, the new heavy-duty hard chromium tank was installed. This tank, approximately 20 feet long by 12½ feet wide by 12 feet deep, holds 22,500 gallons of solution. Heavy steel rollers up to 10 feet long and 10 feet in diameter can be totally immersed for plating. By rotating the roller so that just one segment of the surface is immersed at a given time, rollers as large as 20 feet in diameter and 30 feet long can be handled. Flat steel embossing plates up to 18 feet by 11 feet can also be hard chromium plated in this tank.

Three oil-cooled, sealed selenium rectifiers have been provided for power. One of these is a 15,000 ampere unit, while the other two are 5,000 amperes each. In the event of a power shortage, arrangements have been made for a secondary source of power to cut in and feed the rectifiers. Auxiliary equipment includes six 2 H.P. 8½ inch exhaust blowers, two extra 25 ton cranes, and a group of additional preparation tanks.

Naturally, the installation of such a large tank, in-



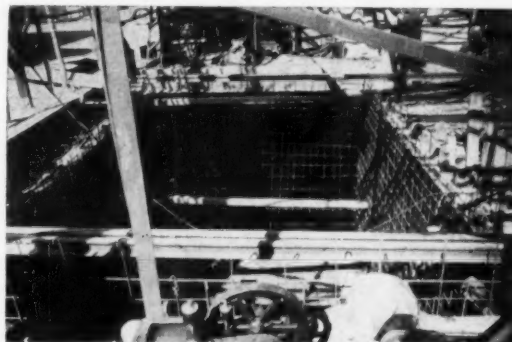
Seam-welding P.V.C., followed by high frequency discharge test to locate any leaks in the weld.

volved considerable engineering and construction work. This is particularly true, since the bulk of the tank had to be below ground, and special precautions had to be taken to prevent seepage of underground water into the tank. The method of construction was as follows:

1. Excavate and construct wood supporting walls.
2. Apply reinforced concrete 6 inches thick.
3. Line this concrete shell with three layers of waterproof asphalt. Pour an inside concrete base 12 inches thick.
4. Install the steel tank in position. This tank is made of 3/16" thick steel plate, reinforced by T-beams and I-beams ready for fastening to the



Tank ready to operate. Dryer for paper mill, 10 feet in diameter by 6 feet deep, is being hauled to the new hard chromium tank after finely controlled polishing operation.



Three layers of asphalt waterproofing have been installed as a liner for the outside concrete shell. Steel tie rods are now put in place to reinforce the inner concrete shell, soon to be poured.

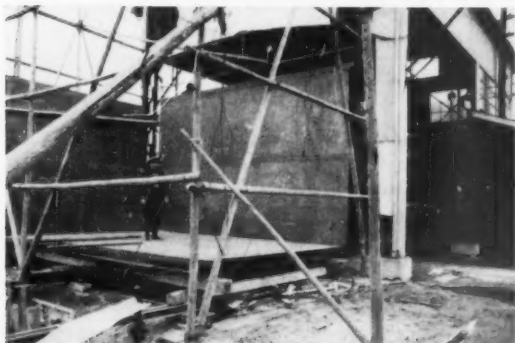
5. surrounding concrete with steel anchor bolts.
5. Pour a second layer of reinforced concrete 12 inches thick, between the steel tank walls and the asphalt liner.
6. Line the inside surfaces of the steel tank with 3/16" thick plates of hard polyvinyl chloride, double seam welded. The welds on the P.V.C. must be rigorously tested for leaks, using a high-frequency discharge technique. Once tests had been satisfactorily concluded, the tank was ready for filling and use.

It required one and a half months time to complete the basic construction of this tank, exclusive of installation of accessories and preparation of solution. Basic materials required for the installation of this oversized tank included 11 tons of steel plate, 2¼ tons of steel

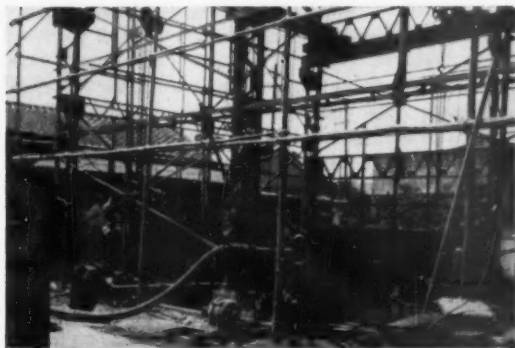
reinforcing rod, $\frac{1}{2}$ ton of steel T-beams, 1 ton of steel I-beams, 115 tons of concrete and $1\frac{1}{2}$ tons of P.V.C. Making up the solution required $28\frac{1}{2}$ tons of chromic acid and related chemicals.

Operating Data

The solution in this heavy-duty, hard chromium tank is maintained at 33 oz./gal. of chromic acid and 0.33 oz./gal. of sulphuric acid. Temperature is thermostatically controlled at 130°F. , and current density for most work is 3.5 amp./sq. in. or 500 amp./sq. ft. These conditions have been found best for most flat or slightly curved heavy work, but are often varied in the other



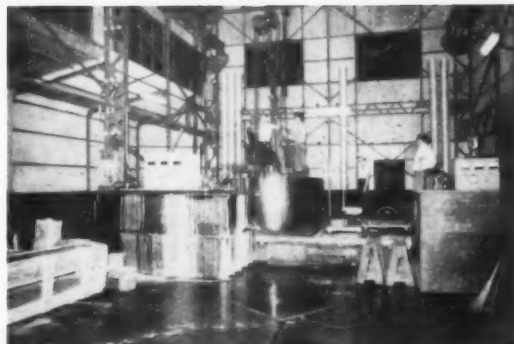
Large steel tank walls being assembled for welding. Tank walls and bottom are $7/16"$ steel plate.



Assembled steel tank, reinforced on outside by T-beams, is lowered into position after the second layer of the concrete bottom has been poured. When the inner concrete walls are next poured, the steel tank will be sealed in position by the anchor bolts set in the T-beams.

tanks where different parts are plated. For example, the chromic acid concentration in different tanks varies from 20 to 53 oz./gal., depending on whether very bright chromium, or very hard chromium, or special purpose chromium coatings are desired.

Solution control is carried out by a well equipped analytical laboratory on the premises. Analyses are made regularly and the solutions immediately corrected for any deficiencies. This laboratory, in cooperation with the inspection section, also does testing for quality control. These include thickness testing (micrometer, magnetic, and microscopic), hardness tests (scratch tests and Japanese 'Showa' durometer), and corrosion testing (hydroxyl test for porosity, salt water corrosion test, etc.). The inspection section operates with a set of



Drying roller being immersed in hard chromium plating tank.

company standards based on modified Japanese Industrial Standards, A.S.T.M. Standards, and U. S. Army and Navy specifications.

One brief comment should be added on the quality of the polishing attained at the Aikoku plant. Many of the roller surfaces and pressing plates handled require an extremely high gloss surface of the highest standards. To attain this, the polishing department has not only had to attain the highest skill in this art, but they have also had to develop new types of polishing apparatus, several of which have been patented in Japan.

Since having become hard chromium plating specialists, the Aikoku Plating Industry Works has received work for many of Japan's most prominent firms. Though many different sizes and types of components have been processed, the bulk of the work done by the firm has been with plates, rubber and plastic molds, large steel drying rolls, combustion engine cylinders, crank shafts, piston rings and, in general, expensive metal components requiring simultaneous protection from corrosion and mechanical defacement and often having to maintain a glossy surface.

With such parts, the firm has been eminently successful and has built for itself an excellent reputation on the Japanese industrial market. The proof of the pudding is that, with such extensive equipment and more than 100 employees, Aikoku has not had to employ a single salesman. In the words of an old Japanese proverb, "The excellent goods draw the customers without voice."



Operation completed. Highly polished surface of drying roll has now been chromium plated to a thickness of 0.004". Note retention of high luster.

Barrel Chromium Plating Continuous Bulk Processing

By Henry Mahlstedt



Henry Mahlstedt, who has been with companies associated with Metal & Thermit Corp. since 1927, is currently product manager for plating products. Prior to that he was sales manager for chromium plating products for seven years. Mr. Mahlstedt is a graduate of Polytechnic Institute of Brooklyn and has a degree in Chemical Engineering.

OPERATION of a newly developed continuous chromium plating barrel, recently installed at International Business Machine Corp.'s electric typewriter plant at Kingston, N. Y. and soon to be installed in their new plant in Lexington, Ky., makes it possible to obtain hourly plating output equal to that from $3\frac{1}{2}$ to 4 batch barrels with greater economy and sharp-

ly reduced need for inspection. The firm has realized several other advantages through use of the continuous barrel. Among them are greatly improved quality of plating, more uniform coverage and reduction in the number of rejects.

IBM employs chromium plating for increased surface hardness and abrasion resistance on small operating parts for electric typewriters. Prior to installation of the continuous chromium plating barrel, batch barrels were employed for this plating. Plating of small parts in volume, especially with chromium, has always presented a number of problems. Until the development of the new continuous barrel, there were three methods of chromium plating available, still tank, basket, and the batch barrel. Use of the still tank for small parts was completely uneconomical because of the cost of racking as well as other operating conditions. Basket plating was the only practical way to plate small parts prior to development of the batch type chromium barrel. The use of batch barrels in the plating of small parts also has drawbacks, perhaps the principal one being that the barrel requires almost constant attention from an operator. The labor cost, while considerably lower than that of tank or basket plating, still left a lot to be desired

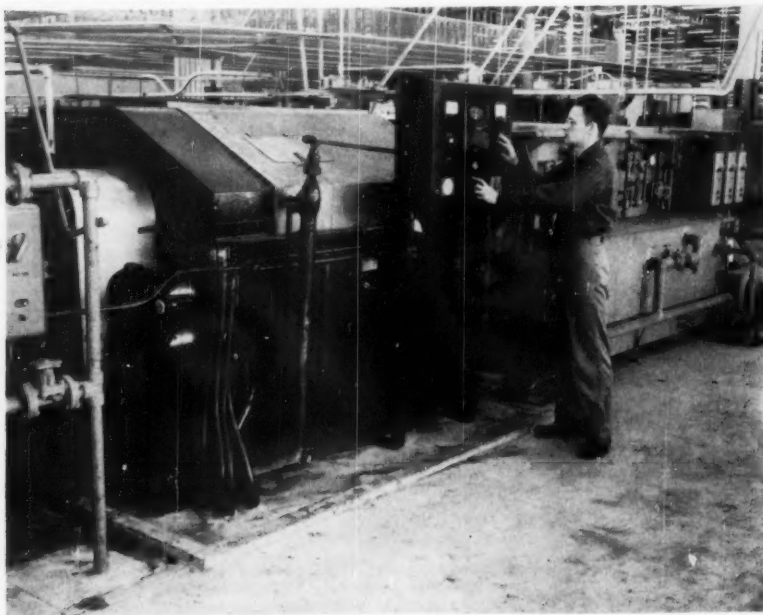


Fig. 1. Overall view of continuous barrel chromium plating installation. Plating barrel is at left and rinsing at right of photo.

(Photos by IBM)

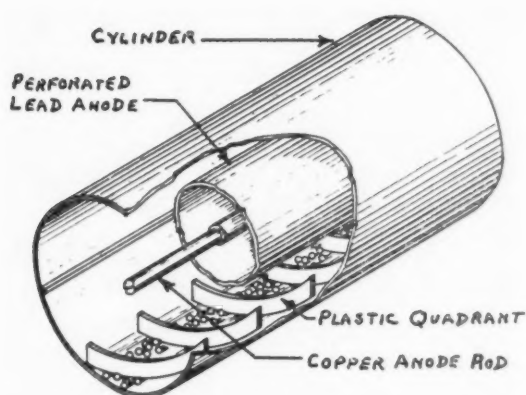


Fig. 2. Schematic sketch showing construction of plating cylinder and anode.

for large volume production. Since one operator could take care of only one or two batch barrels with efficiency, the capacity of these barrels made the operation relatively expensive.

In order to find a solution to the problems presented by still tanks and batch barrels in the plating of small parts, many efforts have been made to develop a continuous operation which would offer excellent plating and still be economically feasible. The first efforts to invent a continuous chromium plating barrel took place in Europe in the 1920's. A number of barrels were developed, but each had some disadvantage that prevented widespread adoption. Designers of one barrel felt that the cause of poor chromium plating in a continuous barrel was insufficient contact to carry the current, which must be higher than that for plating other metals. Their use of electromagnets proved to be unsatisfactory, however. Other barrels were designed, but most were found to have such small capacities as to be uneconomical, and all were short-lived because the insulation materials used were unable to withstand the oxidizing effect of the solution, usually chromic acid.

The European barrels depended on one of two actions. One was a cradling or oscillating action, in which the parts were moved back and forth in the solution. The other was the rotation of a perforated cylinder which held the parts. Both actions were designed to keep

the parts from sticking together and allow each part to receive its proper portion of the deposit.

In the United States the principles of batch barrel plating was discovered at Columbia University, where it was found that, for optimum plating, the hydrogen film on the work should not be disturbed too frequently. As in Europe, use was made in this country of a cylinder immersed, either partially or totally, in the solution and rotated, with a stationary anode attached to the barrel. The barrel itself as well as the parts were plated although, in some cases, the barrel received a more nearly perfect plate than did the parts inside. The advent of the depression in the 1930's called a halt to efforts to discover better methods of chromium plating, and it was not until very recently that any really effective work was done.

The Continuous Barrel

The continuous chromium plating barrel is a self contained automatic unit into which prepared parts are fed continuously and from which a steady stream of plated parts flows. The unit is mounted, complete with the necessary motors, on channel sections to permit easy moving and installation. Principal members are the plating cylinder, the tank for the plating solution, and the drive mechanism. The plating cylinder itself is 24 in. in diameter and 48 in. long, with an especially designed segmented spiral feed to move the parts forward within the cylinder at specified intervals. A cylindrical anode is mounted within the cylinder on concentric support shafts extending beyond the plating cylinder and having anode and cathode contact wheels on each end.

The plating cylinder is mounted on heavy duty bearings to rotate partially submerged in the tank containing the plating solution. The entire unit occupies a floor space of only five by nine feet. The cylinder is driven by a variable speed reducer motor having a range of from one-tenth to one full revolution per minute. At IBM, the solution is circulated throughout the



Fig. 3. Small parts being placed in chute equipped with vibrator which feeds parts into the plating barrel automatically.

cylinder by an air circulation system. This is an unusual installation since, in other units, the circulation is usually handled by an electric pump.

The principle on which the barrel operates is quite simple. The parts to be plated are fed into the intake chute which introduces them into the plating cylinder. Specially designed baffles move them forward in such a way that the plating solution is in constant contact with the parts. Parts can be fed to the barrel by automatic equipment and are then plated and discharged without attention. The time of plating can be adjusted from outside the machine. A proprietary solution is employed at a concentration of 35° Bé and a temperature of 85°F.

When operating at full capacity, the batch barrels formerly used required one operator for each two barrels. It was necessary to maintain constant inspection, to which each part was subjected. Electronic tests were made to assure proper thickness of the plate in those parts which passed the visual inspection. Parts were inserted into the batch barrels and removed by hand and, despite care on the part of the operator, spillage of the plating solution occurred. With the installation of the continuous chromium plating barrel, improvement was noted.

At the outset, and subsequently whenever a new part was to be plated, the continuous cylinder was run at slow speed until tests showed that higher speeds were possible. At first the cylinder was operated at $\frac{1}{4}$ rpm with a 20-min. cycle at 1,500 amp. At present the cylinder is being run at 1 rpm with a 5-min. cycle, using 2,200 to 2,500 amp. at 15 v. The cylinder plates approximately 23,000 parts per hour, a capacity about that of three and a half to four batch barrels. When



Fig. 4. Plated parts drop into tote box after rinsing at end of cycle.

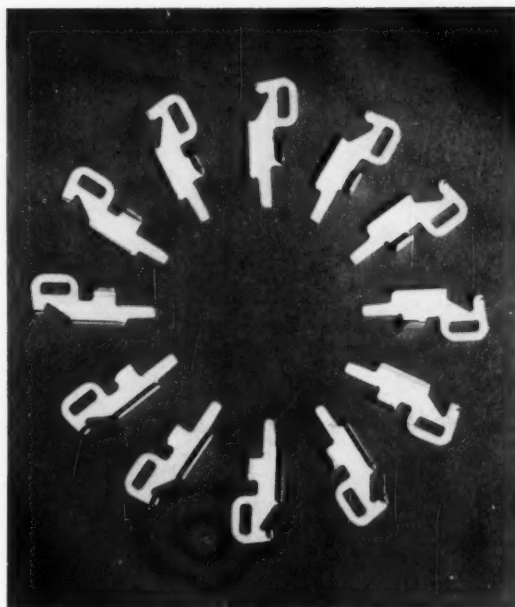


Fig. 5. Plated parts show no contact marks, have uniform deposit.

these continuous barrels are used for decorative chromium plating of screws and similar parts, much higher volumes of production are obtained because of the shorter plating time involved and the fact that larger loads can be handled.

Typical of the parts chromium plated by IBM is a trip lever which is less than an inch in length, less than $\frac{1}{2}$ in. in width and of intricate three-dimensional design. Thicknesses specified are 0.00001 to 0.0001 in. The parts are introduced into the chute in a dry, burnished condition. The chute is equipped with an electrically-operated vibrator; an adjustable wire screen baffle levels and controls the flow of material from the chute to the machine. Once the plating is completed, the parts are conveyed from the machine into continuous rinse tanks by way of another chute equipped with a vibrator. After sufficient rinsing, the parts are automatically discharged into tote boxes.

IBM's experiences with the continuous chromium barrel have resulted in increased production, improved quality of plating and cleaner working conditions for the operator.

As to the thickness of the plating, electronic tests formerly were run with great frequency to assure proper thickness of deposit. Currently, the firm finds that spot electronic inspections for thickness are adequate. The number of rejected parts has decreased, thus introducing additional economies in the plating operation. Company officials feel that it is too soon to establish a definite percentage of increase in production, but they are convinced that it is substantial. Still another saving found by IBM is in production time. They have discovered that one man need spend only a small part of his time in operating the continuous barrel, whereas one man was required full time for two of the batch barrels.

An Introduction to Wash Primers

By E. S. Beck

This is the second and concluding part of this article on Wash Primers. The first half appeared in the January issue.—Ed.

WE have still to look at the solvent in the wash primer from a chemical point of view. It is known that the solvent must be an oxidizable alcohol or similar substance for the necessary reactions to take place. Wash primers have been made up, identical with the PW-1 formula in every respect, except that non-oxidizable alcohols, such as tertiary amyl alcohol were used. None of the desirable properties of the WP-1 primer were shown by this primer, such as adhesion, toughness, etc. But when as little as 10% of the alcohol was replaced by an oxidizable one, such as butyl alcohol, normal WP-1 properties were restored.¹ This is the oxidation-reduction reaction referred to previously, and is considered an indication that some reduced chromium is essential for the proper performance of wash primer. We need go no further into the intricacies of these chemical reactions. We have demonstrated that all four of the principal ingredients take part in the reactions, as far as can be told; and that if any one of them is omitted, unsatisfactory results are obtained.

WP-1 formulation is covered by a government specification, MIL-C-15328 B (the present latest revision). It contains a small amount of lamp black in order to increase the coverage. Good practise requires that the primer be ground during its manufacture in a pebble mill, to avoid contamination with iron.

An interesting peculiarity of the formulation is the necessity for water. If all the ingredients are anhydrous, the mixture will gel almost as soon as the acid catalyst is added. To be safe, about 3% water is customarily added during the manufacture of the product. Larson⁵ points out that there must be 2.4% water present to avoid gelling within five minutes after the acid diluent is added. But if the water content is allowed to go to 6.4% or above, the pigment will become flocculated, producing a rough coating.

Contamination with other materials is also to be avoided. Most of the normal paint vehicles are not compatible with the resin used in wash primer (polyvinyl butyral). In consequence, if the wash primer is used or mixed in containers not completely cleaned from previous use with conventional paints, a flocculation or "kick-out" can occur. Larson states that as little as 5% mineral spirits contamination in the wash primer can noticeably detract from the adhesion of the material.

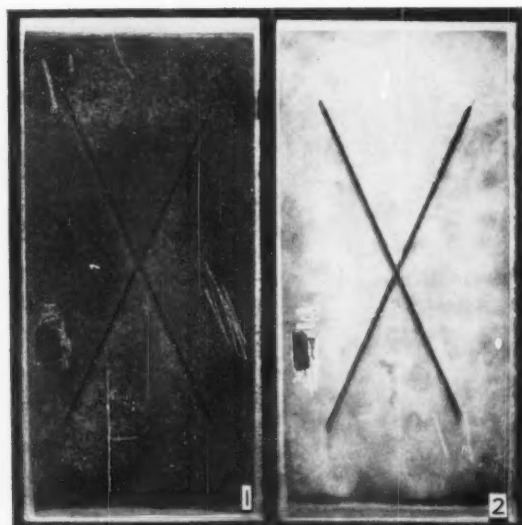
Excessive use of catalyst must also be avoided. Wash

primer is generally shipped in two packages: one of base and one of catalytic reducer, often called acid component or diluent. The ratio of mixing is usually four parts of base material to one part of catalytic reducer. For spray application, this amount of reduction is often not enough to give good spraying properties. It is a mistake to add any further amount of catalytic reducer to reduce viscosity, as this brings in an excess of phosphoric acid. A straight reducer, free of acid, should be used. Generally, an alcohol, such as isopropyl alcohol or butyl alcohol is used for supplementary reduction.

Mention was made earlier that the wash primer should be applied within certain ranges of film thickness. The upper limit recommended varies, but is seldom above 0.75 mil. At this point, blistering, poor adhesion and other problems can be encountered. An interesting sidelight on this subject is given by Rideout.³ Reviewing some work done in a company laboratory, he describes the conductivity test equipment designed to predict the resistance to attack by sea water possessed by the coating. The resistivity of the coating in contact with seawater is measured daily. If the resistivity stays above 1,000,000 ohms per sq. cm. for 30 days the coating may be considered to have acceptable resistance to corrosion in sea water. This has been borne out by observations under actual conditions. The higher this factor is, the better, and coatings which show a resistivity of over 200 million ohms are considered to be very good. The longer these properties are retained on immersion, the better. Systems which start high, and drop rapidly are not desirable.

When these measurements were taken on a film of wash primer alone, of 1.5 mils film thickness, rather low values were obtained. A film of vinyl-red lead primer was also measured, at 3.2 mils. This started out very good but began to fall off steeply in resistivity after 30 days immersion. A third test, based on a two coat system consisting of 0.5 mil of wash primer and 2.9 mils of vinyl-red lead primer topcoat, showed outstanding initial resistivity, and maintained this with very little falling-off in value for the length of the test (about 55 days' immersion). Here is an example of two coats of different materials behaving better than either alone.

Because of the very low film thickness of wash primer which is usually applied, many users think of the material as a conditioner or surface preparation rather than as a coating. In general, its properties lend themselves well to this point of view. In fact, the wash primer is known as a metal conditioner by



Courtesy of Bakelite Corp.

Figure 3. FLORIDA BEACH EXPOSURE

Panel No. 1 is an alkyd enamel applied directly to metal. Panel No. 2 is the same alkyd enamel, applied over a coat of wash primer. Both panels were given 90 days' exposure on the Florida beach. Note that corrosion has almost completely destroyed the film without wash primer (Panel No. 1). Panel No. 2 is in good shape.

some users. Many people who work with the material consider it an acceptable substitute for metal surface conversion pretreatments, such as phosphatizing. Certainly, in the matter of adhesion it has a lot to offer in this respect. Some of the phosphate surface conversion treatments do not significantly help adhesion of coatings.

Certainly, in field-applied coatings, such as those put on large storage tanks, it is now possible, by use of a wash primer, to obtain a metal treatment at least equal to factory-applied surface treatments. Furthermore, the surface obtained with a wash primer is not as critical, or sensitive to atmospheric conditions as is a conventional phosphate treatment. A film of wash primer can be exposed for a few days before painting without the formation of rust. This is not the case with a phosphate coating in similar environments. Also, the film of wash primer can withstand rain and high humidity for a while before it is repainted. As a matter of fact, if the wash primer contains a sufficient quantity of butyl alcohol (as in the case of the specification material) it can be applied directly over damp surfaces without loss of performance properties.

Wash primer works best when applied over freshly sandblasted surfaces. However, it gives very good results when used over solvent-cleaned metal; and is in fact, less sensitive to inadequate metal cleaning than are most other materials. Very few things will work well over loose mill scale or greasy surfaces, and wash primer is not one of these.

Wash primer is a very quick-drying material, which is frequently a great advantage. As there is no oxidation to take place, the film dries as soon as the solvent has evaporated. This means that work can be handled or packed in a matter of minutes after the

coating has been applied. Work can be stored for months indoors with just a single coat of wash primer without rusting; but the limit for outdoors would be one or two weeks.

Up to this point we have been talking about wash primer as though it were a single material. Actually, there are several in actual use today. As pointed out above, the standard, oldest, and most widely-used is the WP-1 type, based on an insoluble type of zinc chromate. This is the type which has the greatest utility, as it is best for a wide variety of metals, such as steel, zinc, aluminum, etc. It also is outstanding for use in atmospheric exposure, and for salt water exposure.

For exposure to fresh water, some improvement in the wash primer is useful. The wash primer is very good, for this use, but not as good as it is in salt water. This small deficiency is attributed to the slight solubility of the zinc chromate pigment, causing a tendency to osmotic blistering.

To overcome this, a wash primer was developed which used lead chromate as the pigmentation in place of the basic zinc chromate. The lead chromate has a far lower content of soluble material. Certain other small changes were made also in the formulation at the same time. The main object of the work leading to the development of this newer wash primer was to develop a single-package material, thus doing away with the need for separate packages of catalyst; also eliminating the short useful life of the wash primer once the components have been mixed together.

The lead chromate base wash primer can be considered as a limited success. It is stable in the package, and requires no addition of outside catalyst. The catalyst is added when the product is made. The mixture is known to be stable for at least 18 months, and may be considered as indefinitely stable for all practical purposes. It is recommended only for steel however. Another limitation is that this primer takes longer to develop adhesion than does the standard formula. It is very good for exposure to fresh water, however, and is the material of choice for this purpose when the application is on steel.

For provision of adhesion to difficult surfaces, the one-package wash primer has real value. But it is not capable of providing the protection against corrosion and underfilm spreading of corrosion that the WP-1 material does. In fact, the properties of the original WP-1 are so outstanding and unique that they have not been equalled by any proposed alternate so far.

The main cause for the never-ending search for a new formula is the fact that the wash primer of the WP-1 type is a two-package material. This provides a continuing source of possible mistakes in the use of the material, both industrially and for maintenance purposes. The material must be mixed fresh each day, in just the right proportions. Left-over wash primer must be discarded, despite the temptations of economy. If consumption for the day has been miscalculated, valuable quantities of the wash primer will be left over. As the material seems perfectly unchanged, the temptation to use it is even greater.

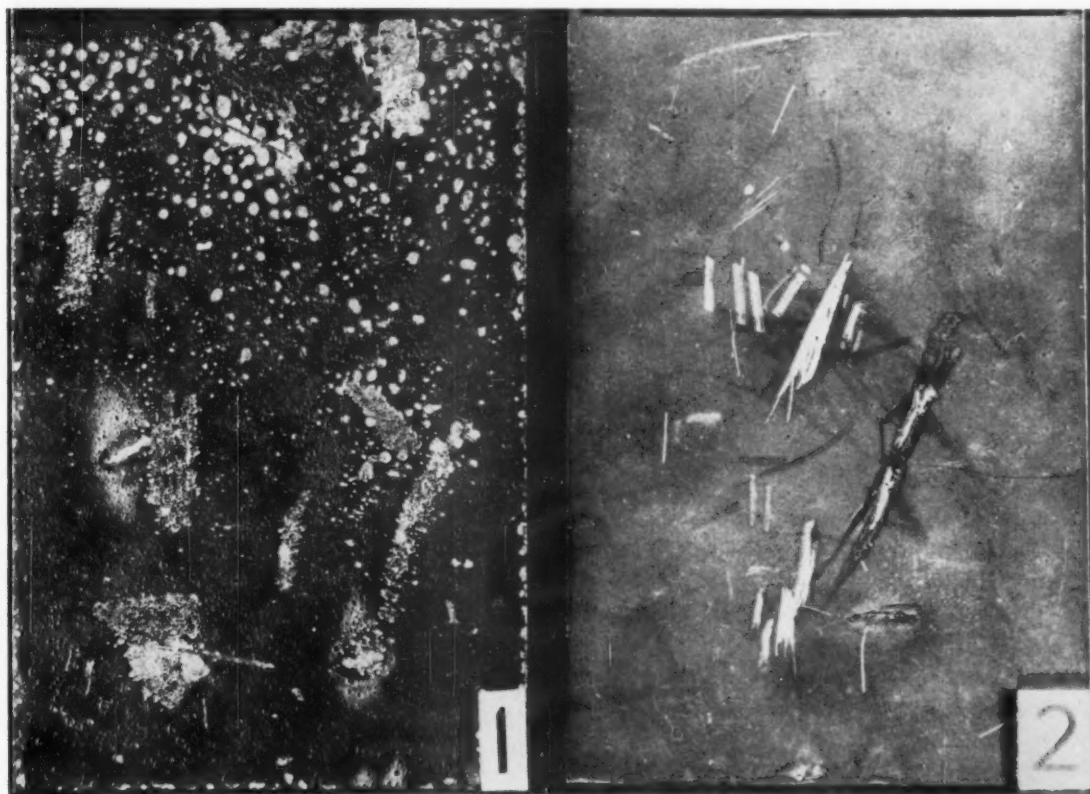
Consider the problems in packing the material for

maintenance or home use. The catalyst must be in a separate bottle or other acid-proof container. Either the user must be resigned to making up a batch and discarding the excess not immediately needed, or some practical means of mixing up divided quantities must be devised. The material could have definite value to home owners for painting galvanized gutters, drains, pails, and the like. It should be of equal value to contractors and builders in new construction, if the problems of handling could be worked out. Certainly, it would be worth much in good-will to the builder and in satisfaction to the home-owner if peeling from galvanized gutters and down-spouts could be eliminated.

There are at least a dozen other wash type primers which have been recommended or are in use. The Corps of Engineers has recently proposed a new material which seems excellent, and which is based, in part on strontium chromate. Another, and more established formula, is based on the use of chromic phosphate as the pigment. Both of these are stable as one-package materials. It is not possible to predict which, if either, of these will develop into popular, wide use items. However, the usage of the standard WP-1 continues to increase, as more and more users become convinced of its value.

A relatively new use for the wash primer, and one which seems capable of very great expansion is the use of wash primer on aluminum siding. Here, the extreme corrosion resistance and outstanding adhesion are of maximum value. Most siding is finished in coil form. The metal is cleaned, and then the wash primer is applied by spray, dip or wipe. After a short flash, the exterior enamel is applied and baked on. Where a top quality enamel is used, the total system is unusually durable. For those who wish to select their own colors, the aluminum siding can be provided in the prime coat only, to be brush-painted on the job. This is uncommon, however.

A very valuable property of the wash primer is its ability to prevent rust creep when the surface of the paint film has been broken. This property is truly unusual in view of the extremely thin films of wash primer which are customarily applied. The author recently had occasion to inspect some outdoor exposure panels which illustrated this point very vividly. These exposures were all on steel, and consisted of a green trim enamel applied over a variety of primers, including a zinc dust-zinc oxide; zinc chromate alkyd; red iron oxide alkyd; WP-1 wash primer; and a number of others. To begin with, the adhesion was better over the wash primer than over any of the



Courtesy of Bakelite Corp.

Figure 4. WATER-SOAK TEST RESULTS

In this case, we are studying the properties of an automotive primer rather than an alkyd topcoat as in the other examples. Panel 1 was prepared by applying a baked automotive primer over cleaned bare steel. Panel 2 shows the same primer applied over a coat of wash primer. (The wash primer film is only 0.2 mils thick). Both test panels were immersed in water at 120 degrees F. for 18 days. The failure is complete on the single coat of primer. Panel 2, with wash primer, is substantially unaffected.

others. The panels had not been scored to evaluate rust creepage, but they had been exposed on an asphalt-and-gravel roof. During the period of exposure, wind had thrown fragments of the gravel against the panels, fracturing the coatings. Rust had formed under these cracks, causing rust spots of various sizes to appear over the surface of the panels. The rust spots were present on every system except the one using wash primer. Here, the breaks in the film from the gravel bombardment were clearly visible, but rusting had not begun.

It has been reported that a type of wash primer has been evaluated for use on auto body steel. It was compared with a metal phosphate treatment customarily used on automobiles. The test showed less rust creep where the wash primer was used.⁴

Where wash primer is to be used on zinc, many users feel the acid content should be reduced in order to avoid the formation of nascent hydrogen and subsequent blistering of the film. Larsen⁵ says that the acid content of WP-1 should be reduced by 75% where the wash primer is to be applied over magnesium.

Many of the highway departments of the states are now using a system of wash primer plus vinyl-aluminum topcoats for the protection of bridges, hand rails, etc. This system is frequently used in conjunction with a precoat of metallic zinc applied by a metalizing process. A system of this nature provides extremely good durability and resistance to corrosion, both of which are important in these applications.

Wash primers are also finding wide use in the oil refining industry for storage tanks, pipe-line coatings, etc. Here is another use where the durability requirements and the necessity for corrosion resistance are very high.

Naval aircraft once were coated using a system of dispersion resin-zinc chromate primer overcoated with high-quality lacquers. The primer gives good corrosion resistance over the aluminum substrate, but the adhesion leaves something to be desired. The Bureau of Naval Aeronautics has changed the system to call for a coat of wash primer on the aluminum surface, prior to application of the dispersion-resin zinc chromate primer. This actually adds little extra time or work to the finishing system, because of the quick dry of the wash primer. Greatly improved adhesion and corrosion resistance have been obtained by this relatively simple improvement in the procedure.

Where baking enamels are to be used, it is wise to stay with the original WP-1 wash primer formula. This shows better heat-resistance than the one-package type for steel. In fact, the lead chromate type is not stable at temperatures above 250 degrees F., which rules it out for most normal baking operations.

Many Florida exposure tests have been run, comparing wash primer, plain steel, and various metal treatments, all topcoated with the same enamel. It is rare when the wash primer does not show better performance, especially less rust creepage, than the metal treatments. It is invariably much better than the plain steel.

Humidity and salt-spray tests generally show pretty

much the same results. The improvement in performance which can be obtained by the inclusion of a coat of wash primer is sometimes extremely remarkable. The advantages of this material, in fact, are so striking, that its adoption by an ever-growing number of users for industrial and maintenance end uses of all sorts can be predicted as almost certain.

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GOLD-DYED ALUMINUM

(Continued from page 54)

dye is added to the orange dyes, in an amount of 0.1 to 0.05 part of the color dye. The dye concentration is 0.6 g./l. for the orange nitro-lacquer dye, 0.2 g./l. for acid orange and 0.08 for acid black. With such a dye mixture, the watches acquire a rich gold color. Other dye mixtures are also used depending on the shade and color tone desired.

Strict Control Necessary

Good coatings can be obtained only when the solution compositions and process technology are strictly observed. Close control of all stages is therefore essential. Watch-making aluminum alloyed with 1 per cent magnesium and silicon must be used in the process. The parts must have surfaces well polished mechanically, prior to being subjected to electropolishing and anodizing.

Special attention must be paid to racking. The parts must have reliable contact with the racks, and the latter must have good contact with the work rod, otherwise a poor electropolish may result, the oxide film thickness may be inadequate, and the final product, after dyeing, may be scrap.

The rack metal must be the same grade of aluminum as is used in the watches. Simultaneous oxidation of parts from pure aluminum and from various aluminum alloys cannot be tolerated. To contaminate the bath with extraneous impurities, particularly the ions of chlorine and iron, is very dangerous.

Rinsing must, in all cases, be very thorough. Before dyeing it is not permissible to wash with hot water, since this causes sealing of the film and the dye will not be adsorbed.

The oxidized surface must not be touched by hand before sealing and complete drying.

Increase in current density, temperature, or concentration of sulphuric acid above the levels designated also causes deterioration of the surface finish.

Titanium - Tipped Anodizing Racks

TITANIUM has tiptoed into the anodizing business and the resultant splash has been a big one. While reams of publicity have been generated by the future of titanium to anodizers and electroplaters, rack fabricators today are selling thousands of titanium-tipped racks which make the outstanding corrosion-resistance qualities of the metal available for immediate use. The success of titanium-adapted racks is the result of:

1. The titanium industry's growing sense of awareness of the little customer — the one who buys titanium in 100-pound lots.
2. Increasing availability of titanium, generated by industry expansion.
3. Price declines which have enabled fabricators to incorporate titanium into their models while, at the same time, holding prices, it is claimed, to within 30 percent of all-aluminum racks.

General Electric's Appliance Park is a good example of a plant where titanium has found a home. Some 650 titanium-tipped racks are in use in the aluminum fabrication section of the Household Refrigerator Department, Appliance Park, Ky., where thousands of refrigerator parts are anodized daily.

The tips determine the life of the rack. Where once racks could only be used for a week to 10 days, the titanium tips have stretched the rack cycle to over three months. Some racks have lasted eight months without repairs.

Begun as an experiment 18 months ago, titanium-tipped racks have been in constant use at GE for the

last 12 months. Company engineers, who keep a calculating eye on the repair bills, have unearthed a fabricating trick which stretches the repair-free life of the rack beyond its normal three month expectancy. Suppliers have been told to leave about an inch of titanium exposed. When less than that amount is exposed, the heat generated by the anodizing operation tends to melt plastisol coatings. The longer the exposed piece of titanium, the more chance the heat has to diffuse before hitting the plastisol. The basic design of one rack producer is an aluminum support, with three-inch-long strips of titanium attached to aluminum springs with stainless steel rivets. The unit is then plastisol coated.

Bar stock and wire have appeared harder to obtain, so that titanium strip has been employed in the ends of springs. Commercially pure titanium, 0.060 to 0.080 gage, $\frac{3}{4}$ inch to $\frac{5}{8}$ inch wide, is suitable. This seems relatively easily available, and random sizes mean a reduction in the price per pound.

Comparative figures below show what one user formerly spent on all-aluminum racks and what is now spent on titanium-tipped models:

	<i>All-aluminum</i>	<i>Titanium-tipped</i>
Initial cost	\$100	\$130
Repairs (March)	75	---
Repairs (April)	75	---
Repairs (May)	75	32
	<hr/> \$225	<hr/> \$162



Rack, before plastisol coating. Titanium tips are relatively minor in the overall shape of the rack but will determine its service life.



Thousands of refrigerator parts are anodized daily in this automatic unit.

Mechanical Springs — Materials, Finishes and Embrittlement

By Lester F. Spencer, *Finishing Engineer, West Allis, Wisconsin*

This is the second and concluding part of this article. Part I appeared in the December 1957 issue.—Ed.

Hydrogen Embrittlement

In the event of a spring failure, the logical approach is to determine the cause of breakage and to recommend procedures to prevent similar failures in subsequent lots of material. Metallurgical defects such as seams, hardening cracks, decarburization, laps, tool and die marks, are easily recognizable and, in many cases, can be avoided by inspection procedures. However, there is one major source of difficulty which, although known to exist for many years, is not as yet completely understood. This source of trouble is attributed to that often used term, "hydrogen embrittlement".

Hydrogen embrittlement has been defined⁹ as a condition of low ductility resulting from hydrogen absorption and internal pressure developed subsequently. There are several characteristics of this phenomenon that are fairly well known, among which we would include:—(a) that an element of "degree of embrittlement" is present; this indicating that a process, such as acid pickling employed in descaling operations, would result in absorption of a good deal more hydrogen than a process such as cadmium plating; (b) that the degree of hydrogen embrittlement will be dependent upon those factors of solution concentration, time of immersion, and operating temperature; (c) that the effect of embrittlement is more pronounced on steels that have high residual stresses resulting from such operations as heat treatment, coiling, etc.; (d) that the embrittling hydrogen can be effectively removed by a relieval heat treatment which has been

described previously; this effectiveness being both temperature and time dependent; and, (e) that the time interval between the source of embrittlement and the relief treatment is critical; especially where the material has a Rockwell hardness over C34. The usual recommendation is that the relief treatment immediately follows the operation where hydrogen is absorbed. Since both the absorption and relief process are temperature — time dependent, many investigators have pointed out the similarity of this phenomenon to a diffusion process.

The recent interest displayed in the extremely high

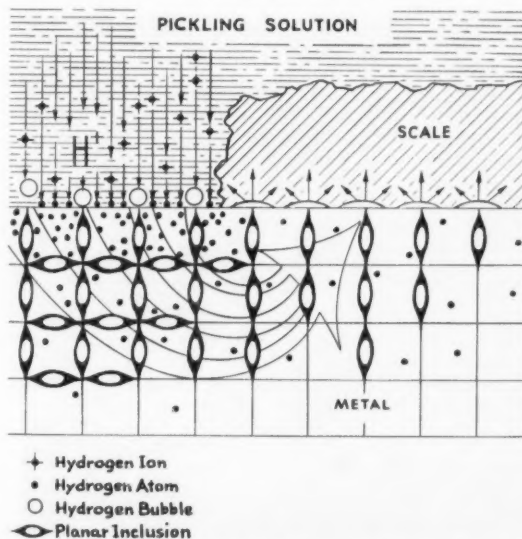


Fig. 1. Diagrammatic sketch of the action of hydrogen in an acid pickling process. (According to Carl A. Zapffe.⁵)

Bend Angle in Degrees

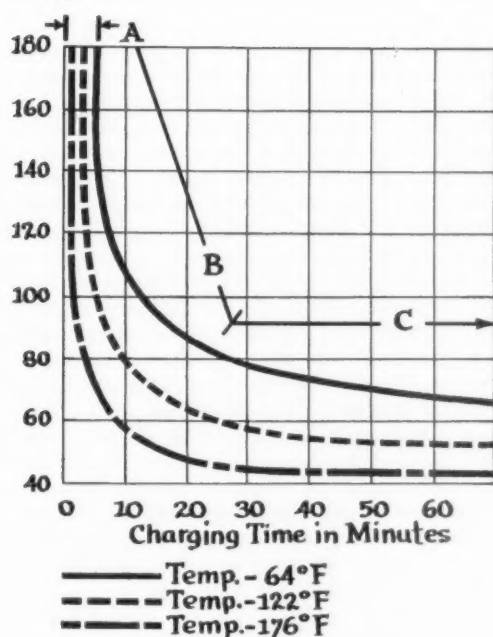


Fig. 2. Embrittlement as function of charging time and temperature. Electrolyte - 10% sodium hydroxide. Current density at 10 amp./sq. in. (According to Zapffe & Haslem.¹¹)

tensile steels in their use for defense applications, such as landing gears, has accelerated research in determining both the mechanism of hydrogen embrittlement, the conditions under which embrittlement occurs, and the effects on mechanical properties. Thus information related to those questions as to — (a) the method employed in the absorption of the hydrogen gas within the metal; (b) the manner in which this gas will cause damage; (c) the conditions under which this damage will occur; and, (d) the method by which hydrogen is released during the relief treatment — would be of tremendous significance to industry. Although basic information is still lacking to answer the above questions satisfactorily, a number of theories have been advanced to explain the action of hydrogen in steel.

Although a complete and detailed explanation of the theories involving this phenomenon is beyond the scope of this paper, it may be well to consider one of the accepted explanations which is based on the pressure theory. The essence of this theory, as given by Zapffe,⁵ is as follows:

In considering the sketch shown in Fig. 1, the theory for the structure of solids is utilized in that each individual grain is composed of a vast number of extremely small clusters of atoms; each cluster being called 'micelles' and represented in the sketch by the squares drawn in that area indicating metal. The operation represented in the sketch is that of acid pickling. In accordance with Zapffe's explanation, "the hydrogen ions, which are chemically active units within the pickling solution, lose their posi-

tive charge when in contact with the exposed metal, forming hydrogen atoms. These hydrogen atoms, because of their small size and their chemical attraction to iron, diffuse directly into the atomic structure of the metal." In regard to the method in which pressure within the lattice is generated, Zapffe states, "Once within the iron, these atoms immediately recombine wherever the atomic structure is loosened and they form in this manner tiny micro-pockets of entrapped molecular hydrogen gas. These pockets are indicated as planar inclusions". He further states, "Hydrogen does not do its damage to steel by the formation of a brittle compound, as was long believed, but instead by the development of pressures of microscopically entrapped gas which actually exceeds the elastic strength of the steel itself".

In order to evaluate the effect of hydrogen in ferrous materials, the standard procedure is to expose the material under test to an active hydrogen producing solution, as exemplified by either a strong acid or alkali, utilizing the accelerating effect of current. The methods used to determine the effect of hydrogen on mechanical properties would include the tensile, impact, static fatigue, and bend tests; the last mentioned procedure being effectively used by Zapffe and Haslem.¹¹ They measured both the absorption and desorption of hydrogen during cathodic and acid pickling of a 17 per cent chromium — 1 per cent carbon stainless steel wire; the evaluation being based on the angle at which breakage occurred during a single bend at constant speed. A true evaluation of the effect of hydrogen in an investigation such as this requires that all of the variables affecting the material investigated, the solution used for hydrogen absorption, and those associated with aging be considered; all but one of which must remain constant in any one specific test.

They found that, with increasing time periods in either acid or alkaline cathodically charged baths, hydrogen embrittlement increased along a curve, as shown in Fig. 2, which is comprised of three stages, namely:— (a) an incubation time (area A) in which atomic hydrogen is absorbed into the lattice without decreasing the bend value; (b) a sudden decline of bend values (area B) which is believed to be the result of the precipitating gas attaining the critical pressure required for embrittlement; and, (c) a gradual slope (area C) which is believed to result from a stabilized inward diffusion once the critical pressure is reached and maintained at the surface. It is also interesting to note that the temperature influences embrittlement adversely, i.e., as the temperature increases, the degree of embrittlement also increases. Another interesting finding in the relationship in the pickling of the stainless steels is that many commercial inhibitors increase rather than prevent hydrogen embrittlement. Two reagents that were found satisfactory during their investigation were quinoline ethiodide and arsenic; however, they were found to be erratic since they decreased hydrogen embrittlement during acid pickling at some concentrations and aggravated embrittlement at other concentrations.

As mentioned previously, hydrogen embrittlement is evident in all types of metal processing; a few examples where this phenomenon would occur being the well known "snowflakes" or "shatter cracks" observed in both wrought and cast steels, the cracking of the heat affected zone observed during arc welding, and the delayed cracking so frequently experienced in heat treated, pickled, or plated steel component parts. The question often arises as to the critical amount of hydrogen that is required to realize this objectionable embrittlement. Some indication of this amount is given by Rinebolt.¹³ Thus, utilizing 300 pound induction heats, gas analysis revealed an inherent hydrogen content of 0.00007 per cent in air melted steel; 0.00004 per cent for vacuum melted steel; and, 0.00005 per cent for argon melted steel. The hydrogen necessary to obtain an embrittling effect, which was manifested by a reduction of mechanical properties, varied from 0.00017 to 0.00026 per cent. They also confirmed that hydrogen absorption increases with increasing current and time in a cathodically charged solution, and that the rate of hydrogen absorption increased as the tensile strength of the material tested increased. Thus, a SAE 4140 composition heat treated to a strength level of 209,000 psi tensile lost 60 per cent of its strength after 4 hours charging time, whereas, the same steel with a tensile of 287,000 psi exhibited the same loss in strength in but 1/2 hour charging time.

Thus, parts that may be highly stressed, or have inherently high strength realized through the medium of heat treatment, require much more care in subsequent operations that may introduce hydrogen within the material. In addition, the small percentages required for hydrogen embrittlement can only be explained on the basis of hydrogen concentrations at local imperfections in the lattice which must exert some pressure to cause such widespread damage, — to change a high strength steel with good ductility to one that will

break in a brittle manner without warning after cathodic charging.

The author has experienced breakage on deep drawn shells that have been cadmium plated. Dale¹ also has had similar experiences in that a cadmium plated deep drawn shell exhibited low ductility at right angles to the direction of drawing and had fractured with a small amount of bending. Investigation revealed that the material could be bent in the other direction over a small radius without failure. This marked directionality of failure experienced in both instances was attributed to stress concentrations induced during forming, which promoted hydrogen absorption during the plating operations. The solution of the problem consisted of a stress relief anneal directly after the forming operation which reduced the strength level to delay this absorption phenomenon. A unique example attributed to hydrogen was also cited by Dale. Thus, small blisters ranging upward to 1/4 inch in diameter developed on a chromium plated 1/4 thick mild steel plate. Examination revealed that a slag filled ferrite band provided the latent weakness necessary for this type of embrittlement failure. Another effect which may have influenced blistering was attributed to the abnormal high sulfate content within the bath; the ratio being 28:1 rather than the preferred 100:1.

The author has experienced a number of failures on stainless steel springs, one of which was a coil spring of about 56 turns used to activate an oven door, whereas, the second example was a formed flat spring. In each case, the material used was the standard AISI 420 stainless analysis. The coil spring failure was not attributed to the heat treat procedure; the cause was not known at the time but it was suspected that the furnace atmosphere in some way attributed to this failure. The flat spring, which was 1 1/4 inches wide and 3/8 inch thick, was cleaned of scale and subsequently polished. This failed due to hydrogen absorption dur-

TABLE IV

Summary given by Zapffe and Phebus¹⁰ as to bend values obtained on Stainless Steel Compositions when heat treated under various atmospheres.

Material, AISI Type	Comments
403 & 410	Can be bent to a full 180° when quenched from air or dry helium over the entire hardening range, but will fracture throughout that same range when the hardening treatment is conducted in steam. For commercial treatments at about 1000°C. (1830°F.) bend values may be as low as 20 degrees.
414	Can be hardened from temperatures up to about 1000°C. (1830°F.) in dry helium without loss of 180 degree bend ability, but this steel will fracture at 30 degrees following an air treatment and at only 10 degrees following a steam treatment at the same temperature.
431	Similar to type 414 but higher temperatures are necessary to produce a given effect by moisture.
416	Is less ductile than type 410 under normal conditions and is proportionately damaged more greatly by steam.
440C	Due to the high carbon content, shows bend values as low as 5 degrees when heated in steam.

ing the pickling operation even though inhibitors had been used. In both cases, difficulty was eliminated in using a relief treatment; this consisted of heating at 450°F. for a period of three hours.

Of interest is the work of Zapffe and Phebus,¹⁰ who showed that steam within a furnace atmosphere during heat treatment will embrittle the stainless steels; the effect of moisture being measured by the bend test apparatus¹¹ developed by Zapffe and Haslem. Thus, AISI types 403, 410, 414, 431 and 440C were heat treated in helium, air, and steam atmosphere, after which they were submitted to the bend test. The results, which are given in Table IV, indicate excellent bend values when heat treated in the helium atmosphere; the low values for type 440C being due to the relative high carbon content within this analysis. The low bend values of types 414 and 431, when heat treated in an air atmosphere, indicates the effect of moisture present as humidity. This fact may explain the difficulty the author had with the coil spring previously mentioned, since failure from day to day was inconsistent even though it appeared that the same procedure had been followed. The extremely low bend values for the material heat treated in steam is convincing as the source of hydrogen.

Conclusion

A wide variety of spring materials are available for industry; the choice being dependent largely upon the end use. Both cadmium and zinc coatings are used extensively to protect both carbon and low alloy spring materials from a corrosive environment, whereas, the non-metallic coatings afford some increased corrosion resistance at relatively low cost.

The most troublesome cause of failure not only in springs, but also, in formed component parts of high strength or under high localized stress, is that identified as hydrogen embrittlement. Although a number of theories have been advanced, one of which is the pressure theory, there still is much work to be done to determine the mechanism of this phenomenon. The fact, which cannot be over-emphasized, is that the relief treatment necessary for the desorption of hydrogen should follow immediately after the material has been exposed to the hydrogen absorption treatment.

Although the best method to avoid embrittlement is to avoid those solutions which will minimize or completely eliminate hydrogen absorption, this is often difficult to follow in many fabricating plants. It should be remembered that hydrogen absorption increases as the hydrogen ion increases in the solution; as both the temperature of the solution rises, and the time of immersion increases; as the strength level of the material is increased; and, in the event of a cathodically charged solution, as the current increases. The amount of absorbed hydrogen that does so much damage is relatively small, which precludes a mechanism involving diffusion, concentration of this gas at lattice faults, and subsequent pressure, which may cause minute cracks to form and results in sudden failure of the part.

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FINISHING POINTERS

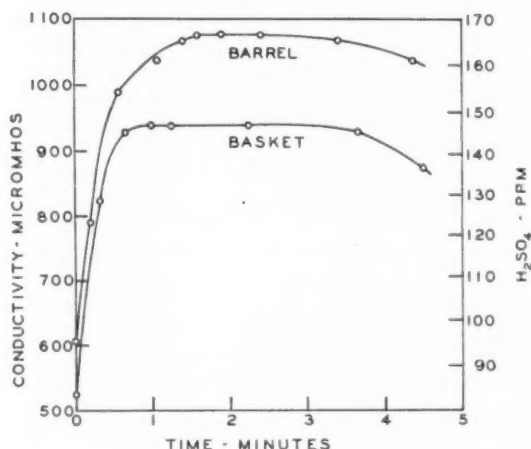
Bulk Rinsing

By J. B. Mohler

HOW much time should be allowed for rinsing of parts processed in barrels or baskets? A great number of parts held at random in a basket will not rinse as readily as spaced or racked parts. The closely packed parts restrict the flow of solution, and so require some time for removal of the solution in a running rinse tank. Obviously, small parts or parts that touch on flat faces will be difficult to rinse. There are not enough data to specify the minimum rinsing time from the known geometry and size of parts. However, it is easy to determine the rinsing time by means of simple conductivity measurements.

Data taken for a barrel and a basket are shown in Figure 1. The barrel contained small parts of such shape that solution was not retained in narrow spaces between the parts. The total surface area was estimated to be 80 square feet. The rinse tank contained 300 gallons of water flowing at a rate of 4 gallons per minute. The solution being rinsed away was 5 per cent sulfuric acid. The barrel was allowed to rotate while in the rinse. A basket with a generous open mesh containing a similar volume of parts was rinsed under similar conditions. The basket was merely allowed to hang in the running rinse.

The data show that it took about one minute to reach a maximum concentration at the conductivity cell when the basket was rinsed, while for the barrel 1½ minutes was required. Even though the barrel was rotating it did not rinse as readily as the basket. This was primarily due to the fact that the small holes in the wall of the barrel did not allow solution to flow readily through the container. The motion of the rotating barrel undoubtedly hastened rinsing. On the other hand, it is well worth notice that the flow of the rinse water was effective in removing solution from the hanging basket.



Data of this type are of value to determine the optimum rinsing time. A short rinsing time will result in excessive acid retained on the work, whereas a lengthy rinsing time holds the work unnecessarily at the rinsing station.

It is seen that the acid concentration does not drop immediately after reaching the maximum. Apparently, the acid concentration is slightly higher inside the container and, for about another minute, the acid is being removed from the container at the same rate that it is carried away by the running rinse. After about three minutes there is a definite drop in the acid concentration. If time is not important the rate of drop in the acid concentration will depend on the flow from this point on. The acid concentration can be substantially decreased by allowing the work to remain in the rinse. The time to decrease the acid concentration to any desired level can be decreased by increasing the flow.

The amount of drag-in to the rinse can be easily determined by rinsing in a non-flowing agitated rinse. Agitation is continued until a maximum, constant conductivity is obtained. The increase in acid concentration can be determined from the increase in conductivity and, in turn, the drag-in can be calculated. Such methods are being used to solve rising problems.¹

Reference

1. Rinse Tank Control, Metal Finishing, September 1955, p. 66.



Science for Electroplaters

33. Cyanide Waste Treatment-- Ozonation and Electrolysis

By L. Serota

IN addition to chlorine and hypochlorites for the treatment of cyanide waste, several other methods or agents have been investigated and reported. Although their use in preference to chlorine has been limited, owing to such factors as economy in operation or toxicity, developments in some cases indicate promise of adoption for plant scale operation. The added factor of restrictions (priorities) in a national emergency (such as, in this instance, the use of chlorine in treating cyanide wastes) was cited in 1951 by R. G. Tyler and associates as the basis for their investigation, during the Korean War, of the effectiveness of ozone in the oxidation of cyanide wastes.

The authors found ozone to be as effective an oxidizing agent as chlorine, as well as permitting a more easily controlled residual, since the aerated water, during the ozonizing process, cannot hold more than 3 ppm. of ozone in solution. C. A. Walker and W. Zabban noted that its oxidation potential is second only to that of fluorine.

Ozone is a gas possessing a pale blue color in dense volumes and compares in odor with chlorine or garlic. It forms in small amounts during lightning discharges in the atmosphere, or as a result of intense ultraviolet light. It may be prepared in the laboratory by passing a current of dry air (or oxygen) between two glass tubes lined with tin foils or silver. The metal foils serve as the electrodes or plates for a high voltage electric discharge produced by an induction coil. Commercial units capable of generating a one to two per cent by weight ozone mixture are now available. The instability of the ozone mixture and the low concentration make it necessary to install ozonators at the

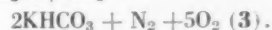
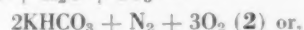
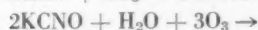
source of treatment. Operation is relatively simple and maintenance is negligible. It is used in water purification, for oxidation of organic matter, and in the bleaching of paper pulp, textiles and starch.

Development of a process, on a small pilot plant scale, has been reported recently for the separation of oxygen and ozone by adsorbing the ozone with silica gel and then desorbing it. Another development reported, indicates that a new type ozonator is expected to reduce investment costs 25 per cent.

Ozone-Cyanide Ratio

For their laboratory study of ozonation of cyanide wastes, Tyler used a cadmium plating solution. The ozone, produced by a laboratory generator, was bubbled through the cyanide waste solution by means of a porous diffuser placed in the bottom of the treatment chamber. This method permitted complete absorption of the ozone by the solution. When just a trace of the cyanide remained, small quantities of ozone, it was noted, escaped through the vent. Oxidation of the cyanide is very rapid. In one series of runs, the concentration of a solution containing 46.0 ppm. CN^- (in 1500 ml.) was reduced (oxidized to cyanate) to 2.8 ppm. CN^- in 8 minutes, as evidenced by the appearance of ozone in the air exhaust. This means that 46.0 — 2.8 or 43.2 ppm. CN^- was oxidized. The unit, parts per million (ppm.), represents the number of milligrams of solute per liter; hence 43.2 ppm. is equivalent to 43.2 milligrams CN^- per liter or $43.2 \times 1.5 = 64.8$ mg. CN^- in 1500 ml. or $64.8 \div 1000 = 0.0648$ gram CN^- in 1500 ml. of cyanide solution. Since 0.118 g. of ozone was required for this

oxidation, the ratio of ozone to cyanide becomes $\text{O}_3 : \text{CN}^- = 0.118 : 0.0648 = 1.82:1$. This ratio compares closely with the stoichiometric quantities, 1 mole ozone per mole CN^- , 48 (O_3) : 26 (CN^-) or 1.84:1; that is, 1.84 pounds ozone per pound CN^- based upon the first of the three equations postulated for this reaction:



The second (slower) stage of oxidation of the cyanate (Equation 2) required 0.034 gram ozone with 0.0925 ppm. CN^- remaining. The total amount, therefore, of ozone used was $0.118 - 0.034 = 0.164$ gram, and the cyanide oxidized was equal to $46.0 - 0.925 = 45.075$ ppm. or 0.0676 gram (0.045075×1.5) CN^- in 1500 ml. The ozone:cyanide ratio, by weight, for oxidation becomes $0.164:0.0676 = 243:1$ (2.43 pounds ozone per pound CN^-). If the cyanide had been completely oxidized, then the (theoretical) ratio of ozone to cyanide, by weight, would be according to Equation 3, 5 moles ozone (O_3) to 2 moles cyanide (CN^-) or $(5 \times 48) : (2 \times 26) = 240:52 = 4.61:1$. The authors stress the fact that additional runs would be needed to confirm these values.

Control of pH (between 11.0 and 12.0) during this ozonation process, it was observed, would result in improved efficiency, since complete oxidation of cyanide to cyanate will occur only above a pH of 8. Oxidation beyond the cyanate stage (to nitrogen and bicarbonate) was inefficient. For efficient treatment a bubble column with 10 to 15 feet liquid depth is recommended. Additional suggestions by the authors, based upon their results, include venting of exhaust gases from the building to prevent deterioration of rubber insulation or equipment, and the use of plastics (Saran), wood, aluminum, copper, stainless steel, or black iron coated with an asphaltic surface in ozonating units, as materials capable of withstanding oxidation.

Oxidation Mechanism

At about the same time that the above results of the ozonation of cyanide wastes were published, a report

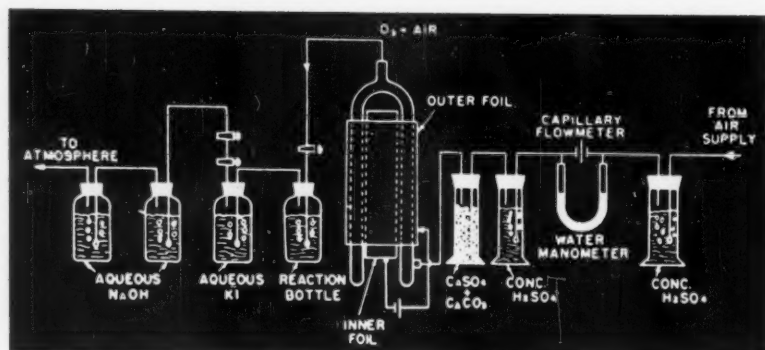


Fig. 150. Apparatus for ozonation of cyanides.

was in preparation on a similar investigation, as part of an A.E.S. Research Project, relating to the mechanism and extent of the oxidation of free and metallo-complex cyanides by ozone. Solutions representing waste copper and zinc cyanide plating solutions were made up for this study. The ozonator was similar in construction to the one previously mentioned. The ozone was prepared from air, previously dried, by passing it through concentrated sulfuric acid and anhydrous calcium sulfate. The mixture of ozone and air was bubbled through the reaction chamber, a 500 ml. bottle, by means of a sintered glass tube. Glass or plastic tubing (Saran or Tygon) were found to be suitable as delivery lines for the ozone. The unreacted ozone was trapped and measured by allowing the gas mixture to bubble through a 5% aqueous potassium-iodide solution. The free ozone was determined by titrating the liberated iodine with a standard sodium thiosulfate solution, with starch as the indicator. Two bottles containing sodium hydroxide solutions, which served the purpose of decomposing the ozone (produced during the preliminary stages of ozonation of the air) into oxygen before discharging into the atmosphere, complete the train (Fig. 150).

Experimental results showed that a fairly steady rate of ozone (about 1.2 per cent by volume) could be attained only after operating the ozonator for about one-half hour. Because the unit was not water-cooled, more nitrogen pentoxide (about 0.1 per cent by volume) formed as a result of higher temperatures. pH measurements were made with the glass electrode-type meter, and cyanide determinations were made by the modified Liebig titrimetric method (with potassium iodide and p-dimethylamino-benzalrho-

damine as indicators). Cyanates were determined by the Nessler tube method.

Catalysts, such as copper sulfate and divalent manganese sulfate, which are oxygen carriers, were found necessary, when solutions lacked such metal catalysts for the oxidation of cyanide to cyanate. For example, treatment of sodium cyanide and zinc plating solutions, with an initial total cyanide concentration of about 200 ppm., resulted in 100 per cent reacted ozone when the catalysts copper sulfate and manganese sulfate were added, with a metal ion concentration of 10-20 ppm.; but only 40 to 60 per cent of the ozone added reacted when these catalysts were omitted. Copper plating solutions did not require a catalyst.

It was also observed that the cyanide radical in a ferrocyanide compound is not oxidized by ozone. In one result reported, a solution of potassium ferrocyanide with 200 ppm. initial total CN, showed a zero per cent ozone reacted with a total of 198 ppm. CN remaining. Oxidation of cyanide waste by ozone is carried to the cyanate stage. When the cyanate is treated, results showed that most of the ozone bubbled through, thus remaining unreacted. Catalysts do not improve the efficiency of this second oxidation reaction.

The ratio of ozone to cyanide varied between 1.05 pounds and 1.57 pounds ozone per pound of cyanide. The difference in the experimental ozone requirements is attributed to two possible reactions, depending upon whether one atom of the ozone molecule reacts (Equation 4), or the entire molecule (3 atoms) takes part in the oxidation (Equation 5).



The molar ratio of CN^- to O_3 is 1:1 or 26:48 = 1.85 parts (or pounds) of ozone per part (or pound) of cy-

nide and 3:1, or 78:48 0.62 part (pound) of ozone per part (pound) of cyanide respectively. The view is expressed that the reaction between ozone and cyanide is somewhere between the two equations.

An appreciable drop in pH resulted in most of the runs, which is explained on the basis of the weaker cyanate base forming and the formation of nitric acid resulting from the nitrogen pentoxide in the solution. The per cent by volume of nitrogen pentoxide in the ozone-air mixture was reported as about 0.08. A pH above 10 was recommended as a safeguard against HCN volatilizing. The free cyanide ion, it was observed, is oxidized before the metallo complex ion in the solution. Oxidation of cyanide to cyanate is instantaneous — an important factor, since the low solubility of ozone in solution (water) at any point (pH) would result in the gas escaping unreacted. The pH range for effective oxidation was given as 7 to 12.5.

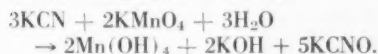
An advantage cited for the use of ozone is that it does not leave any toxic products. A disadvantage mentioned is the limitations of the oxidation to the cyanate stage within the contact time allowed. This factor is not insurmountable, since hydrolysis of the cyanate ion to the ammonium ion may be effected by lowering the pH of the solution to about 3. Ozonation is considered satisfactory for large volumes of solutions with concentrations of less than 5 ppm. cyanide (CN) since the cyanate formed would be less than 10 ppm. CNO which is rated below the toxic concentration. Caution must be exercised in the treatment of solutions of such low cyanide concentrations, since unreacted ozone may escape and create toxic concentrations near the treatment tank.

In a study relating to the toxicity of ozone, R. A. Watson reported that experimental results indicate that nitrogen oxides have no direct effect on the toxicity of ozone to spores, but that ozone is the toxic agent in ozonized air, whether the ozone is produced from pure oxygen or air at the same concentration. Nitrous oxide, N_2O , and nitrogen pentoxide, N_2O_5 , are the only oxides that can possibly exist in ozonized air. It was also reported that the oxides may affect the acidity of the medium but this, it was noted, had a minor effect on the toxicity of ozone for pH values from 4.3 to 7.95. As

the medium becomes acid (below a pH of 4.3) an interaction between ozone and the acid will result in increased toxicity.

Permanganates

The possible use of potassium permanganate as an oxidant for cyanide waste has been given attention. This reaction, wherein the cyanide is converted to the cyanate, according to E. F. Eldridge, will occur quantitatively in neutral or alkaline solution, if sufficient time for complete oxidation is allowed. The equation given for this reaction is as follows:



One part by weight of KCN or 0.0154 mole ($1 \div \text{KCN} = 1 \div 65 = 0.0154$) will be oxidized by 1.62 parts by weight of KMnO_4 or 0.0103 mole ($0.0154 \times \frac{2}{3} = 0.0103$; $\text{KMnO}_4 \times 0.0103 = 158 \times 0.0103 = 1.62$).

The experimental study was based on a prepared cyanide solution containing 4 grams KCN in 20 liters (a 5 gallon tank) or 200 ppm. CN as KCN. The tank contained a sludge draw-off valve, and mixing of the solution was effected by placing an air diffusion plate in the bottom of the tank. When treatment of the waste at temperatures of 18°-22°C. and pH range of 7.0-7.8 was begun in the late afternoon and the bath then allowed to stand overnight, complete oxidation resulted. The sludge, consisting of brown manganic hydroxide Mn(OH)_4 with a small amount of calcium carbonate, settled in about 15 hours. Its volume was about five per cent of the original waste volume, but decreased to about one per cent on standing. The sludge, when drawn off, dried very rapidly on a sand bed. The rate of oxidation was increased with increase in operating temperature.

A study of the effluent and sludge remaining after treatment, made by Dr. C. L. Hubbs, to determine the toxicity threshold with shiners, showed that the undiluted waste was somewhat toxic, especially when not aerated. A one to one dilution, however, was sufficient to permit the fish to live. The results, according to the author, indicated that possibly some KCN was left in the treated waste (less than 1.0 ppm.) or that the toxicity threshold of the cyanate (KCNO) lies between 125 and 250 ppm. Sludge from this treatment, it was found, was not toxic up to 600 to 1000 ppm.

Mn(OH)_4 , but a solution containing 1280 ppm. Mn(OH)_4 killed the fish in about 2½ hours. The author concluded that the permanganate oxidation method reduces appreciably the toxicity of cyanide waste. Treatment of a plating solution should include dilution to a cyanide concentration as KCN of 500 ppm. or less. M. M. Ellis referred to 5 ppm. KMnO_4 as being toxic to fish. B. F. Dodge and associates have noted that they could not find, in their investigation of cyanide electroplating waste disposal methods, any case of commercial treatment by the permanganate method. Also, in an article in the 39th Annual Proceedings, A.E.S., on the engineering phase of cyanide waste disposal, Dodge added that the permanganate method of oxidation would not be economical, owing to the high cost of the reagent.

Electrolytic Oxidation

A process that shows promise involving oxidation of cyanide waste solution, particularly for concentrated wastes, is based upon electrolytic oxidation. This method, according to the publication *Methods for Treating Metal-Finishing Wastes* (Orsanco, 1953) is rated on the basis of performance as one of the cheapest ways of decomposing concentrated waste. It is considered especially suitable for conditions where reduction of concentrated solutions may be supplanted by secondary treatment for removal of remaining cyanides. D. A. Cotton referred to cyanide oxidation as one of the methods in use by the General Motors Corp. for disposal of plating wastes. With insoluble anodes and a hot copper solution, copper will deposit on the cathode and cyanide is reduced to about 1 ppm. Further reduction of the cyanide, if desired, can be attained by the hypochlorite process. Electrolytic oxidation at an Ohio plant has been mentioned wherein the cyanide content of a 1000 gallon plating solution was reduced from 10 oz./gal. (74,400 ppm.) of cyanide to 0.5 oz./gal. This concentration was further reduced by the lime-sulfur process. No mention was made of the electrodes, current density or other operating conditions.

Two other examples using this procedure have been reported. R. W. Oyler referred to the specific conditions, with which one plant was confronted in disposing of large quantities of storage cyanide waste with too

high a carbonate content to warrant reclaim for plating use. The problem was complicated by the high cost of reagents (chlorine and hypochlorite) because of wartime restrictions. Against this background, the development of the electrolytic oxidation method of disposal of cyanide waste seemed feasible. Since that time, cyanide waste disposal has been concerned mainly with solution entrained by the precipitate formed when a copper cyanide bath is treated with barium hydroxide for carbonate removal.

After the sludge formed in the above procedure is treated with hot water (about 3 times the sludge volume) at 170°F., the decanted liquid containing the entrained solution is electrolyzed at 200°F. The washings are repeated until the solids are sufficiently free of cyanide to be dumped safely. Copper anodes were used in place of steel because of polarization when the latter were tried. A high current density was used and a high cathode to anode ratio was most effective. The chemical reactions are, presumably, deposition of copper on the cathode, oxidation of cyanide radical to cyanate at the anode, and (as proposed by L. B. Sperry), the formation of urea in solution. As an example of destruction of cyanide, a solution containing over 7 oz./gal. of copper cyanide was reduced to 0.03 oz./gal. in five hours. An average decomposition rate of cyanide is given as 1 oz./gal. per day. The added observation was made that this rate varies with cyanide concentration, with much higher rate of cyanide decomposition for high concentrations and a corresponding lower rate for dilute cyanide solutions. This method, however, is not practical for rinse waters because of the low conductivity. Operation was carried out in 1200 and 1800 gallon tanks.

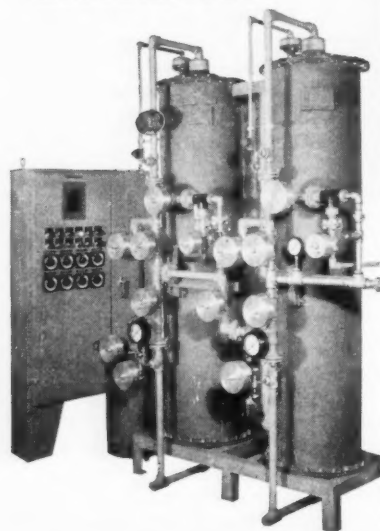
The destruction of cyanide copper solutions by hot electrolysis, as reported by L. B. Sperry and M. R. Caldwell, provides more quantitative data for such operations. This study was concerned with a satisfactory disposal method for cyanide copper solutions which were not suitable for continued use. The laboratory program on copper strike solutions and stock solutions included the effects of variations of temperature (120°-200°F.), current density, (16 and 32 ASF for cathode, 3.3 and 6.7 ASF for anode) and agitation. A four-liter stainless steel beaker was used, with the metal beaker serv-

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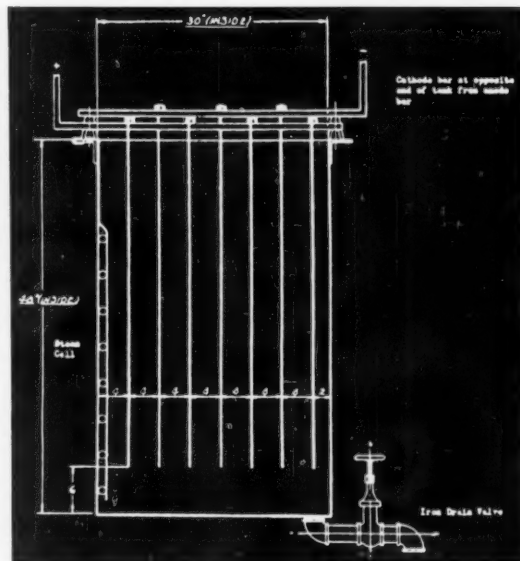


Fig. 151. Proposed tank for destruction of copper strike solution. Anode and cathode areas 6 (sides) x 3 1/4 x 9 1/4 feet or 182 sq. ft. (anodes and cathodes begin 4 inches from tank ends).

ing as the anode and a brass panel as the cathode.

Results indicate that the rate of decomposition of the cyanide increases at higher current densities and temperatures. For example, in one the test cyanide and 3.22 oz./gal. copper, operating at a cathode current density of 32 ASF and a temperature of 190-210°F., with the pH maintained between 10.0 and 10.5, complete destruction of cyanide and the removal of copper required 16 hours. The time for different runs, however, varied considerably, a condition attributed by the authors to the presence of contaminants. Sodium carbonate, it was found increased by about 2.5 oz./gal.; about 3 oz./gal. of sodium bicarbonate formed, and the concentration of cyanate remaining ranged from 0.17 oz./gal. (1000 ppm.) to 0.7 oz./gal. (5000 ppm.) cyanate (CNO). Since the maximum tolerance to toxicity of cyanates is considered 1000 ppm. (CNO), the concentration of cyanate remaining in the electrolytically treated copper cyanide solution is sufficiently toxic to require its decomposition by sulfuric acid and boiling.

Full Scale Operation

For this plant (Grand Rapids, Mich.) operation, a 700 gallon processing tank 10 x 2.5 x 4 feet deep was installed with carbon-steel anodes and cathodes (Fig. 151). For a trial run on a Rochelle copper strike solution an average current density of 36 ASF was maintained with a 6 volt potential. The current dropped from 2800

amperes at the start to about 400 amperes after 35 hours. The copper, with an initial concentration of 2.10 oz./gal., was completely removed in 18 hours; and the cyanide, with an initial concentration of 2.8 oz./gal., was reduced to zero in 35 hours. The temperature during this test run

ranged from 175° to 195°F. The data are represented by the graph (Fig. 152). The pH of the solution dropped from 13 to 10.2 and was reduced to a pH of 6.5, before dumping, by adding the calculated amount, 20 gallons, of sulfuric acid. The maximum anode and cathode areas for this tank, 182 sq. ft., were not utilized for this test run, and stainless steel anodes were rapidly attacked during the latter part of the run.

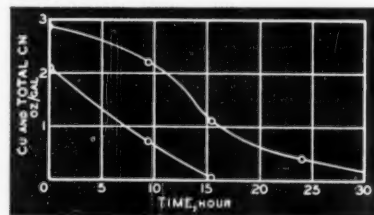


Fig. 152. Results of 700-gallon plant test on total cyanide, CN, destruction (top line), and copper deposition (bottom line).

The following advantages are given for this process: simplicity of operation; complete decomposition of cyanide with the elimination of other toxic products; elimination of the sludge disposal problem; use of plant equipment, hence, low cost; recovery of metal by deposition, and disposal of a wide range of solution concentration (discarded plating baths). Efficiency of operation decreases, however, as the concentration of cyanide is reduced. The method is not satisfactory for rinse waters because of the low conductivity of such solutions. This process of electrolytic oxidation for disposal of cyanide solutions was also stated to be practiced by the National Cash Register Co. of Dayton, Ohio.

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METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Zinc in Silver Baths

Question: As a subscriber to your various publications I would like to ask you to give me any information you can on the effect of zinc (from plating die castings) that would accumulate in my bright silver strike tank on the plated article immediately and later on (shelf life).

E. L. S.

Answer: The deposition potential of zinc is so much higher than that of silver that deposits will be pure silver, despite the presence of zinc in the solution, under normal operating conditions. Since the deposits will be pure silver, zinc in the solution will have no effect on shelf-life.

Metalizing Plastics

Question: In the silver mirror process, how do I obtain an unbroken film of water on the surface of plastics? I would also like to know the chemical etch method for the removal of glaze.

L. H. J.

Answer: A water-break-free film is produced by cleaning in the usual alkaline cleaner operated at a temperature sufficiently low to avoid softening of the plastic, usually at about 135° F.

The type of chemical roughening solution required will depend on the type of plastic. For thermoplastic resins, immerse for about 2 minutes at room temperature in a solution of 100 cc. sulfuric acid, 15 g. potassium dichromate and 50 cc. water. For thermosetting resins, immerse for about 3 minutes at room temperature in a solution of 100 g. hydroquinone, 25 g. pyrocatechin and 1 liter acetone.

Hard Chromium

Question: This USAF activity has

requirements to salvage hard chrome plated aircraft components. Information on the following questions is kindly required, if available:

a. Is it feasible to remove worn chrome plating by grinding rather than chemical stripping? Discount time element and assume necessary stress relief on all operations.

b. Can good chrome plating be deposited on a partially ground chrome surface?

c. What is the engineering objection against chrome plating on chrome?

J. W. Y.

Answer: There is no objection to removal of chromium by grinding instead of chemical stripping. It's just a matter of economics.

Good chromium deposits can be deposited on a partially ground chromium surface. However, if the steel is exposed in spots, there may be trouble with adhesion because of the difficulty of pretreating chromium and steel together.

We know of no engineering objection to plating chromium on chromium, if the proper pretreatment is employed. Information on the subject will be found in the METAL FINISHING GUIDEBOOK, 1957 edition, page 265.

Specification Gold Plating

Question: I would appreciate very much information regarding "Specification Gold Plating," also any literature about this process.

P. P.

Answer: Specification gold plating is a term which covers any gold plating of specified thickness or weight. The term "Gold Electroplate" or "Gold Electroplated" can only be employed if the deposit is 0.000007" minimum.

Otherwise, articles may be marked "Gold Flashed" or "Gold Washed."

There is no special process for specification gold plating, although, for heavy deposits, the new bright, high-speed baths are generally used.

Brass Tarnish

Question: We are having some difficulty with brown spots on our flash brass plate. Our plating cycle is 6 minutes flash in a barrel cylinder type bath over nickel plate. Our line from the generator is 12 volts, with a 3 volt drop rheostat, which gives us 9 volts at the tank. The cylinders are 20" x 36" with standard button type contacts. We plate two baskets of hardware in each cylinder (approximately 2 cu. ft. per cylinder). The tank load draws approximately 375-400 amps. We are using the formulas from the METAL FINISHING GUIDEBOOK, page 273.

Can you recommend any change to keep the brass from burning or spotting? I am enclosing some of the parts, along with a self addressed envelope.

J. E. T.

Answer: Examination of the sample forwarded indicates a very thin coating of lacquer on the brass, so that the plate will tend to tarnish right through the lacquer film.

A heavier lacquer coating will eliminate this condition. The absence of iridescence in the lacquer film, which is now quite evident, can be employed as a rough indication of sufficiency of lacquer.

Aluminum Name Plates

Question: I would like to know how to make aluminum name plates such as you will find enclosed. If the Guidebook does not have this explained in it, would you kindly send me material from whatever magazine or book in which this might be available.

O. J. Q.

Answer: The finish on the nameplate forwarded is produced by printing the background with a resist, after which the article is anodized and dyed. The

resist is then removed with solvent. This is a standard procedure in the manufacture of aluminum name plates.

Tungsten Plating

Question: We are trying to find information on tungsten plating. We would appreciate anything you can tell us about it and any source of information you might supply us with.

W. E. M.

Answer: Tungsten in pure form has not been produced commercially from aqueous solutions. However, it has been deposited as an alloy with iron, nickel and cobalt, in various proportions.

Methods are described in the book "Modern Electroplating," sponsored by The Electrochemical Society, and a complete list of references will be found in this volume, should further investigation be necessary.

"Oxidized" Silver

Question: We vaguely recall having seen, at one time, a reference to an applied finish for silver called "Liver of Silver." To the best of our recollection, this is a sulfide coating. We would appreciate it if you would tell us what this coating is and how it is applied.

W. B. H.

Answer: Liver of Sulfur, also known as potassium sulfuret, is a crude mixture of polysulfide and thiosulfate, formerly employed for the production of sulfide colors on copper, brass and silver. Because of the low grade of this material, finishers now employ polysulfide solutions, known as "oxidizing liquid," and available from most plating supply firms under various trade names.

For "oxidizing" silver, the parts are immersed in a hot solution of from 2-4 oz./gal. to which an equal amount of ammonia may be added. A gunmetal gray silver sulfide film is obtained quite rapidly.

Plating on Aluminum

Question: We have a problem in the silver plating of aluminum bus bars. These bars always have small blister marks at the points of contact where they are racked. We have tried various methods of racking to eliminate this but with no success.

Our racks are made with phosphor bronze spring contacts and are periodically cleaned to remove any pickup. Slightly more blistering seems to occur when they have heavy pickups. We

plate the aluminum by the zincate process with an underlying layer of copper.

D. H. R.

Answer: Blistering at the point of contact may be due to pocketing of zincate solution, which may attack the zinc film before it can be rinsed off. It may also be caused by the aluminum becoming anodic, which will often occur if a large surface of phosphor bronze is exposed at the point of contact.

It is suggested that the contacts be made of aluminum alloy or, if phosphor bronze is necessary, they should be stopped-off so that a minimum of

surface is exposed to the zincate solution. If aluminum is employed and blistering is still experienced, it may be desirable to move the contact point during immersion or to change the method of contact.

Sludge in Strip Tank

Question: We have 30 gal. of nickel sludge from a sulfuric strip tank. Is this material of value, or should we dump it?

L. J. S.

Answer: The sludge accumulating in a sulfuric acid strip tank is a mixture of copper, nickel, zinc and iron sulfates. The material has no practical value and should be dumped.

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ABSTRACTS

Influence of Periodic Current Reverse with Copper Plating from Sulfate Baths

J. J. Wene: *S. A. Z. fiz. Chim.* (Moscow). Vol. 29, No. 5, p. 811.

Of importance for the quality of the copper coating obtained from sulfate baths, is the ratio of the time of the cathodic loading of the electrode t_K to the time of the anodic loading t_A . It was found that the most favorable conditions were obtained when the ratio was arranged so that $t_K/t_A = 7$, independent of the duration of the period and of the current density. With smaller t_K/t_A ratios, the deposit obtained is porous and, with greater ratios, the anode is insufficiently polarized and irregular sized crystals are formed.

Chromium Coatings on Die Cast Tin Alloys

Zinn und seine Verwendung (Düsseldorf). No. 34, (1956).

Pressure die cast alloys of tin — 90%, lead — 8.5% and copper — 1.5% were investigated. It was found that the chromium plating applied was flaking off to an unusual extent. After a careful pre-cleaning, the parts were given a light copper plate and subsequently finished in the normal manner with nickel and chromium. The flaking occurred only during use, after some years.

As no copper was to be discerned either on the flaked-off nickel particles or on the surface of the basis metal, it was obvious that the copper coating had diffused into the surface of the basis metal. In order to confirm this, special test parts were processed.

By means of further tests it was established that the following procedure is to be recommended:

- Degrease with trichlorethylene.
- 2-5 minute cathodic treatment at 5.5 amp./sq. dm. in 5% sodium carbonate solution at 60-65°C.
- Rinse in hot water.
- 15 second dip in 10% acid.
- Rinse in hot water.
- Nickel plate in a fluoborate bath: nickel fluoborate, 300 g./l.; boric acid 30 g./l.; temperature 43-

54°C.; current density 1.1 amp./sq. dm.; pH 2.7. The adhesion of the coating does not change after a year's storage.

Surface Protection Treatments for Special Metals to Prevent High Temperature Oxidation

H. Bueckle: Publication No. 1, *Office National d'Etudes et de Recherches Aeronautiques* (Paris). p. 33.

With the investigations which have been conducted up to now, as well as with tests conducted by the author, no practical solution has been obtained to the problem of rendering the high melting refractory metals such as tungsten, molybdenum, niobium, and tantalum insensitive to high temperature oxidation by suitable surface alloying treatment. Accordingly, comprehensive tests were undertaken to achieve non-oxidizing stability of these metals by surface treatment. Six possibilities were investigated:

- Melting—in the protective coating.
- Deposition of the protective coating from the vapor phase.
- Sintering-in of the protective coating.
- Mutual high temperature sintering of core metal and protective coating.
- After-compacting of scale-coatings by sintering.
- Chemical production of the protective coating.

The tests conducted on (2), (3) and (5) led to no satisfactory result. Processes (1), (4) and (6) are to be regarded as corresponding to requirements. In particular, the following three possibilities were obtained for scale-protection:

A. By melting in or vapor-phase deposition of platinum or the platinum metals in surface coatings at least 20 microns thick, the oxidation scaling can be prevented. The platinum can be applied in the form of a paste of platinum chloride. These coatings adhere and protect perfectly.

B. Production of the bodies by powder metallurgy processes in such a manner that, between the metal powder of the core and the oxide powder of the protective coating, an intermediate coating of a mixture of metal powder and oxide powder is applied. These protective coatings also adhere well and protect completely from scaling, with suitable choice of the oxide.

In place of the metal core with the intermediate coating, a mixture of metal powder and oxide powder is applied. These protective coatings also adhere well and protect completely from scaling, with suitable choice of the oxide. In place of the metal core with the intermediate coating, a mixture of metal powder and oxide powder can also be used.

C. By treatment of tungsten with hydrochloric acid or chlorides as for example, by immersion in a sodium chloride solution, the oxidation of the surface is reduced to a fraction of its former value. The scale coatings adhere only moderately well but do not peel off, are dense, and retain the shape of the body. The process is confined to scaling temperatures up to about 1,400°C. or short heating times at higher temperatures, on account of the relatively low melting point of the tungsten oxide (1,475°C.). With short-term demands, there is possible a continuous renewal of the protective action by repeating the chloride treatment. In addition, it appears to be possible to reduce the oxidation if the attacking gases contain chloride vapors.

Test Run of a Supersonic Cleaning and Degreasing Plant

Metallwaren Industrie und Galvanotechnik. Vol. 47, No. 7, p. 316.

The installation consisted of the following parts:

- A tank 1.5 meters long which is half filled with trichlorethylene or another cleaning fluid.
- Two high frequency generators which feed four ultrasonic transducers mounted in appropriate positions on the tank.
- A large filter float by means of which the cleaning fluid, which is maintained in continuous circulation, is freed from the suspended dirt particles.

A transporting arrangement driven by rolls is placed in the tank. The parts are placed in baskets and these are arranged to revolve on the transport equipment, in the tank. The baskets slowly pass through the tank, in line, each basket of component parts being exposed for about one minute to the powerful supersonic vibration field. At the end of the tank, the baskets are rinsed with freshly filtered trichlorethylene and are then removed. The baskets then revolve further in a zone

in which the parts drip and are dried.

With the co-action of a suitably chosen cleaning fluid and the mechanical rotary motion, the maximum possible degree of cleaning is obtained. If parts are being handled which are highly polished and which do not need to be treated in the revolving baskets then other equipment is provided for the transport of the parts.

The frequency of ultrasonic vibrations must be at least 20,000 per second. For compact and large parts magnetostrictive vibration generators are employed with this equipment, which operate at this frequency. For very thin component parts, very much higher ultrasonic frequencies are recommended for the cleaning treatment and, for equipment for cleaning these small parts, the frequency being about 1 million per second. The large installation described works at this high frequency but can be equipped to work at the lower frequencies.

Action of Ultrasonic Vibrations on Metal Plating Processes

Dr. A. Roll (Max Planck Institute of Metal Research), Paper Read at Ultrasonic Symposium, Germany, 1956.

The author dealt first with the general effects and action of supersonic vibrations in connection with the subject of plating. It was explained that, among other things, through the action of the ultrasonic vibration, the flow velocity of an electrolyte is considerably increased. While, with mechanical stirring in a plating bath, a greater flow velocity of the bath electrolyte is also produced, at the cathode however, this amounts in itself to practically zero. As against this, with the action of supersonic vibrations, the distance from the cathode is independent. It was then explained in detail how the action of an intensive stirring effect, as is obtained with ultrasonic vibrations in the plating bath, affects the current efficiency of a bright nickel bath, low in metal.

To deposit the same coating thickness of bright nickel plate, only a tenth of the time was needed when supersonics were employed in the bath than with a mechanically stirred bath. With the application of supersonics, the current efficiency was somewhat reduced. Similar results on test were also obtained with copper plating baths while, with chromium plating,

no such clearcut results could be recognized.

The author stated that deposits with ultrasonics are practically pore-free and of uniform thickness. This can be ascribed to the fact that no gas bubbles occur at the cathode when ultrasonic vibrations are applied to the plating bath. With mechanical stirring of the bath, the grain size of the plated metal is coarser. Simultaneously, it was established with the tests that the adhesion of plated metal coatings is not improved with the use of ultrasonics. There was found to be no diffusion of the plated metal into the base. X-ray examination showed that there are no structural differences between the metal plated out with ultrasonics and that plated under normal conditions. It was shown that the alloy coatings are produced which it is not possible to produce in a plating bath which is merely stirred mechanically, as the separation potentials change.

Various interesting points were also raised and discussed in the discussion to this paper. It was stated that the application of ultrasonics to metal plating processes is, at the moment, applied only to gold plating. It was also stated that only further development and research work in this field will show whether the additional expense will be justified in practice by the results obtained.

Determination of Porosity of Chromium Plated Coatings

H. Benninghoff: *Metallwarenindustrie und Galvanotechnik*. Vol. 47, No. 7, p. 305.

In the application of porous chromium coatings, the percentage of the area of the network compared to the total chromium surface is of importance, and a measuring process must be available for the ascertainment of this percentage. For large scale operations, a microscope is utilized, in conjunction with a projection apparatus. With this, the microscopic picture is projected onto a screen and can be observed.

Where an apparatus of this kind is not available, the surface condition is evaluated through a magnifying glass. A certain amount of acquired personal skill is necessary here to conduct the operation satisfactorily. It is an advantage to have available large scale prints taken with a microscope, of typical satisfactory chromium net-

worked surfaces, with which comparison can be made. The network percentage area in relation to the total surface area should be clearly marked on each print; a range of about eight prints is suitable, from 10% up to 50% in 5% increments. A magnification of about 100 is suitable for the standard comparison prints. A pocket microscope is useful for examining the chromed surfaces to be tested and making the comparison with the standard section photos, reproduced in the text.

Relationship Between Polarization and Throwing Power in Plating Baths

W. Savelsberg: *Metallwarenindustrie und Galvanotechnik*. Vol. 47, No. 7, p. 292.

The formulas which have been evolved and developed for establishing the throwing power of plating baths were compared critically by the author and it was demonstrated that these contain either involved values or have been unduly simplified. A new formula for the purpose has been developed from the known relationship of the throwing power to the slope of the current density-voltage curve. This formula shows a quite simple relationship between the throwing power, the spacing of the electrodes and the slope of the current-voltage curve and appears to be suitable, to ascertain the throwing power mathematically.

As the throwing power is closely associated with the polarization, all measures which serve to raise the polarization, also improve the throwing power. If the current density-voltage curves of the baths normal to plating practice are considered, it can be seen that these curves in baths containing complex ions have a lesser slope generally than those with simple ions; with increase in current density, the cathode potential, accordingly, rises for complex ions, more than with simple ions. The author then develops a formulation from these facts, serving to relate the throwing power and the polarization.

Internal Stresses in Electroplated Copper

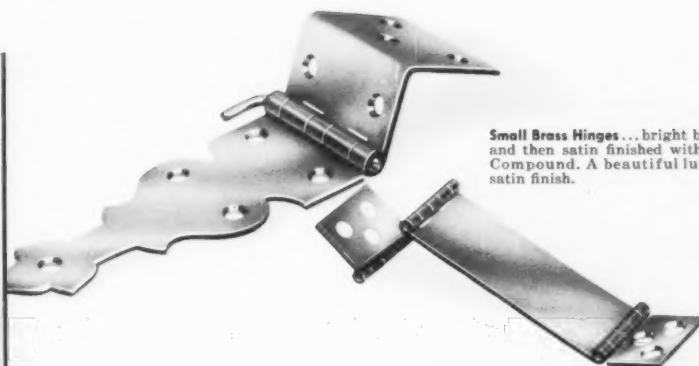
H. Fischer, P. Huhse and F. Pawlek: *Zeitschrift fuer Metallkunde*. Vol. 47, No. 1, p. 43.

The authors first discuss the origin

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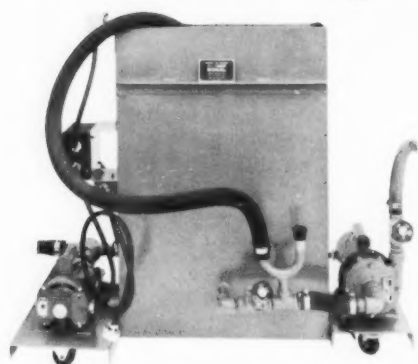
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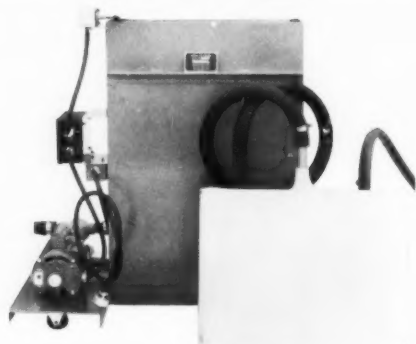
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of the internal stresses. Their mechanical determination by means of the contractometer is then considered. Deformation curves are given for different durations of treatment and thicknesses of copper deposit, in the presence of variable quantities of inhibitors (gelatine and beta-naphtho-quinoline). The mechanical stresses are calculated from the curvature of the test parts after plating.

There is then considered the magnetic determination of the stresses. The influence of inhibitors is discussed. Details are given of comparative tests on Permalloy strip. The influence of inhibitors on the micro-hardness of the deposit is considered. Other matters discussed are the crystalline structure of the deposit (photomicrographs are reproduced in the text). Also, according to the type of inhibitor present and its concentration, the obtaining of a crystallization of the plated copper with an oriented texture. Information is given on the existence of an intermediate zone in which there is no internal stress.

Improvement of Wear Resistance of Cold Stamping Dies by Chromizing

G. Dubinin and B. V. Galchenko: *Stanki i Instrument* (Russia). Vol. 26, No. 8, p. 17.

A detailed study is given of the advantages of gaseous chromizing of steel dies and punch heads, for the cold heading of bolts, screws, rivets, etc. The production yield of the dies (1% carbon, 0.20% manganese, 0.30% silicon) with thermal treatment after chromizing, is compared with the dies given a simple chromizing treatment.

Mechanical Tests for Electroplated Deposits

R. Weiner: *Galvanotechnik*. Vol. 46, No. 12, 546.

The author studies successively the research which can be conducted on electrodeposits, for the verification of the following points:

Thickness of the Coating: A precise test method which, however, is lengthy and causes the destruction of the object is sectioning perpendicular to the surface, followed by polishing and examination under the optical micro-

scope. The chemical methods of measuring coating thickness by ascertaining the loss of weight are more rapid but less precise. Another method is to cut through the surface with an abrasive wheel whose diameter is exactly known, until the basis metal is exposed. This method can give erroneous results if there are small surface irregularities. The magnetic, non-destructive methods are more sure.

Porosity: The verification of coating porosity by microscopic examination requires a preliminary chemical attack to render the pores visible either by enlarging them or by coloring them by attack of the subjacent metal. Salt spray testing is similarly applicable.

Adhesion, Ductility: This is usually verified comparatively by folding tests. Folding or bending is conducted over a rod of known diameter for comparison.

Hardness: This is tested either by the Brinell or Vickers diamond point method. The indications given are variable according to the test loading employed. It is possible to measure the width of a scratch caused by a diamond, but there is no real correspondence with the preceding methods.

Wear Resistance Tests: Wear resistance tests do not entirely classify the test parts in their order of hardness. Other facts such as elasticity, etc., also enter into play with the wear resistance test.

Mechanism of Electropolishing Nickel

W. Machu and A. Ragheb: *Zeitschrift fuer Metallkunde*. Vol. 47, No. 3, p. 176.

Chemical and electrolytic polishing treatments are conducted in baths which are strongly acid or alkaline, so as to obtain a rapid solution of the metal. In the case of electropolishing, the temperatures are high, as well as the current densities which can reach 100 amp./sq. dm. It is known that surface projections are quickly smoothed away, a relatively brilliant surface is then obtained without having a mirror polish, and the surface subsequently becomes covered with a coating of oxide. Tests were undertaken to obtain information on these phenomena.

A detailed description is given of the test methods. The authors discuss the influence of the current density on the speed of passivation, on the por-

osity of the surface coating, and on the time of polishing, also, the influence of the operating temperature. Details are given regarding the anodic behavior and the passivity of nickel in the electropolishing baths.

It was found from this study, that the passivation of nickel is immediate, that the whole process is effected through the coating of oxide, and that the maximum brilliance is attained for the current density giving a maximum of porosity to this coating. The leveling action is derived from the fact that the coating of oxide is thinner at the peak of the surface micro-projections, so these are attacked at a faster rate by the electropolishing solution.

Residual Stresses in Electroplated Deposits

A. T. Vagramyan and Y. S. Tsareva: *Zhurnal Fizicheskoi Khimii* (Journ. Physical Chemistry—Russia). Vol. 29, No. 1, p. 185.

The authors first make a critical examination of the theories existing on the origin of residual stresses in electrodeposits. A study of the problem is based on the automatic recording of the variations in the stresses during the course of electrolysis by a method of flexion of the cathode.

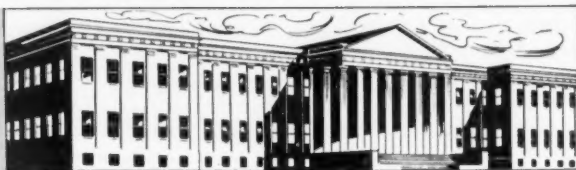
Details are given of the variations of the residual internal stresses according to the nature of the metal being plated (chromium, nickel, zinc, copper, lead, cadmium and palladium), and with the conditions of electrolysis. A correlation is developed between the internal stresses and the overvoltage, the data being presented in the form of a table.

The authors discuss variation of the internal stresses according to the nature of the organic and inorganic addition agents, for example with surface-active products (wetting agents). There is then considered the influence of foreign bodies absorbed by the deposit, such as hydrogen or metals, on the condition of the internal stresses. These data are again presented as a table.

Attention is devoted to the variation of these stresses once the plating current has been interrupted. The broad results of the investigation are then critically examined and their interpretation discussed as a function of a plurality of causes instead of one single actuating factor.

Patents

RECENTLY GRANTED PATENTS
IN THE METAL FINISHING FIELD



Addition Agent for Acid Copper Bath

*U. S. Patent 2,799,634. July 16, 1957.
R. E. Woehrlé and J. W. Condon, as-
signors to Westinghouse Electric Corp.*

An aqueous electroplating electrolyte comprising essentially copper sulfate sulfuric acid, from 0.01 to 1.0 ounce per gallon of dextrose and from 0.005 to 0.015 ounce per gallon of 1-acetyl-2-thiohydantoin.

Addition Agent for Acid Zinc Bath

*U. S. Patent 2,799,635. July 16, 1957.
A. E. Chester and R. F. Main, said
Chester assignor to Poor & Co. and said
Main to Acme Steel Co.*

An aqueous acid zinc sulfate plating bath comprising an acid zinc sulfate electrolyte, a quantity of thiourea sufficient to produce a fine grained ductile zinc deposit when zinc is electrodeposited from said electrolyte and a quantity of a peptone sufficient to enhance the brightness of said deposit.

Nitrided Gun Barrel with Chromium Deposit

*U. S. Patent 2,799,959. July 23, 1957.
E. F. Osborn, assignor to the United
States of America*

A gun barrel having a bore therein, said bore having a nitrided surface hardened to a value that will resist plastic deformation at prolonged high temperatures, and a thin adherent deposit of erosion resistant material superimposed on the hardened bore surface.

Bright Gold Bath

*U. S. Patent 2,799,633. July 16, 1957.
E. C. Rinker, assignor to Sel-Rex
Precious Metals, Inc.*

In the art of forming a layer in excess of .000005" thickness of bright gold containing about 0.1 to 2% of silver by electrolytic deposition, the method which consists in electrolyzing an electrolyte containing the following components in the following propor-

tions dissolved in one liter of water:

	GRAMS
Free potassium cyanide.....	45 to 200
Potassium gold cyanide.....	6 to 48
Potassium silver cyanide..	0.08 to 0.4

the proportion of potassium silver cyanide calculated as silver to potassium gold cyanide calculated as gold being between 0.1% and 2% by weight, and maintaining said bath at a temperature of between 45°F. and 80°F.

Conversion Coating

*U. S. Patent 2,800,422. July 23, 1957.
A. Piccinelli.*

A process for rustproofing and preparing iron articles for painting which consists in the steps of forming on the surfaces of said articles a coating of at least one phosphate selected from the group consisting of iron phosphate, zinc phosphate, and manganese phosphate, dissolving the phosphate coating thus formed, and passivating the newly exposed metal surface by applying to said surface a solution containing a member of the group consisting of chromate ions and dichromate ions.

Chromium Plating

*U. S. Patent 2,800,437. July 23, 1957.
J. E. Stareck and E. J. Seyb, Jr., as-
signors to Metal & Thermit Corp.*

A method for reducing the loss of fatigue strength following chromium plating of an article of hard steel comprising electrodepositing chromium on the article by passing a current of 1 to 6 a.s.i. to said article as cathode in an aqueous chromium plating bath at a temperature of 120 to 170°F., said bath comprising essentially 400 to 800 g./l. of CrO_3 , a sulfate-containing compound and a silicofluoride-containing compound each in an amount to provide, as catalysts, 0.5 to 6.0 g./l. of dissolved sulfate, $\text{SO}_4^{=}$, and 0.1 to 16.0 g./l. of dissolved silicofluoride, $\text{SiF}_6^{=}$, respectively, the sum of dissolved sulfate and dissolved silicofluoride varying with the CrO_3 concentration as follows: as the CrO_3 increases

from 400 to 800 g./l., the lower limit of said sum increases linearly from 2.7 to 4.4 g./l. and the upper limit of said sum increases linearly from 9.0 to 17.0 g./l., plating chromium on the article to form a coating at least 2 mils thick, heating the plated article to a temperature of 200 to 800°F. for a sufficient duration to produce a chromium plated article of said hard steel having a fatigue strength of at least 60% of that of the original unplated steel.

Chromium Plating

*U. S. Patent 2,800,438. July 23, 1957.
J. E. Stareck and E. J. Seyb, Jr., as-
signors to Metal & Thermit Corp.*

A method for reducing the loss of fatigue strength following chromium plating of an article of steel having a hardness of 33C to 47C Rockwell and a fatigue strength of 70,000 to 110,000 p.s.i., comprising electrodepositing chromium on the article by passing a current of $\frac{1}{4}$ to 6 a.s.i. to said article as cathode in an aqueous chromium plating bath at a temperature of 130 to 150°F., said bath comprising essentially 150 to 250 g./l. of CrO_3 , a sulfate-containing compound and a silicofluoride-containing compound each in an amount to provide, as catalysts, 0.8 to 2.5 g./l. of dissolved sulfate, $\text{SO}_4^{=}$, and 1.2 to 5.0 g./l. of dissolved silicofluoride, $\text{SiF}_6^{=}$, respectively, the sum of dissolved sulfate and dissolved silicofluoride varying with the CrO_3 concentration as follows: as the CrO_3 increases from 150 to 250 g./l. the lower limit of said sum increases linearly from 2.3 to 3.8 g./l. while the upper limit of said sum increases linearly from 3.7 to 6.5 g./l., said plating temperature increasing within said range as said sum of dissolved catalysts increases, plating chromium on the article to form a deposit about 5 to 15 mils thick, said deposit being characterized by having 1200 to 10,000 crack-lines per inch and a compressive stress of 0 to -20,000 p.s.i., and thereby producing a chromium plated article of hard

steel having a fatigue strength of at least 85% of that of the original unplated steel.

Plating on Titanium

U. S. Patent 2,801,213. July 30, 1957.
F. O. Beuckman and W. M. Tucker,
assignors to Eastman Kodak Co.

A method of electroplating a firmly adhering metal coating onto a thin titanium layer which comprises cathodically cleaning the titanium surface in an alkaline solution containing sodium orthosilicate, activating the cleaned surface in an aqueous stannous chloride solution, adding a relatively thin copper coating thereover by dipping into an aqueous copper reducing solution containing copper sulfate, sodium hydroxide, Rochelle salts, potassium sulfate and formalin, electroplating a copper layer thereover from an electrolyte comprising copper sulfate, Rochelle salts, triethanolamine and water while employing a current of 28 amperes per square foot and further electroplating the surface in a copper cyanide electrolyte comprising copper cyanide and free sodium cyanide while holding the pH of the solution at approximately 10.

Chromium Plating Bath

U. S. Patent 2,801,214. July 30, 1957.
M. R. Zell.

A chromium plating bath comprising an aqueous solution containing per liter 100 to 500 grams chromic sulfate, 100 to 500 grams urea, 50 to 300 grams of a substance selected from the group consisting of ammonium, potassium and sodium sulfate, and 1 to 100 ml. formamide.

Fused Bath Cleaning

U. S. Patent 2,801,215. July 30, 1957.
H. G. Webster, assignor to Kolene Corp.

A process for electrolytic cleaning of ferrous metal which comprises immersing the metal in a dry solid molten salt bath comprising 75 to 99.5% by weight of alkali metal hydroxide and the remainder comprising a substantial proportion totalling at least 0.5% by weight of compounds comprising alkali metal silicate and alkali metal fluoride, said fluoride and silicate being each present in quantity sufficient to form at least 0.5 weight per cent of alkali metal fluosilicate and



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*Designated the GearChem**, this pump is suitable for speeds to 1750 rpm at capacities to 10 gpm and pressures to 100 psi. Viscous media to 5000 SSU can be pumped at reduced speeds.

The GearChem created tremendous interest at the recent Chemical Show. In addition to proportioning and metering applications the pump is ideal for general process work in pilot plant and production operations.

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* T.M. Applied For

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STEEL FABRICATOR INCREASES PRODUCTION WITH SPEE-FLO PACKAGE UNIT

PROBLEM: To finish an additional 15 tons of fabricated steel daily with no increase in facilities or personnel.

SOLUTION: Installation of Spee-Flo "Little Chief" Portable Hot Spray Unit.

The Offenhauser Company, Houston, fully expected to add to its spraying area and paint crew in order to finish $\frac{1}{3}$ more products daily. However, with Spee-Flo Portable Paint Heaters, they handled the increased production *without adding to their overhead*. Overspray is greatly reduced, and they enjoy big savings in solvent and coating materials.

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SPEE-FLO

Dept. MF-35, 720 Polk Ave., Houston, Texas

7531

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cleaning the metal by passing current through said metal as an electrode while immersed in said bath.

Bright Gold and Silver Baths

U. S. Patent 2,800,439. July 23, 1957. J. Fischer and W. Schwarze, assignors to Deutsche Gold- und Silber-Scheideanstalt vormals Roessler.

A method of electroplating a metal selected from the group consisting of gold, silver and gold-silver alloys on a base member which comprises electroplating the base member in an electroplating bath comprising an aqueous cyanide solution of a salt of the selected metal and containing as a

brightener a condensation product of an unsaturated aldehyde selected from the group consisting of acrolein and its alpha substitution products and a compound with a group $>C=S$ selected from the group consisting of carbon disulfide and alkali metal xanthate in an amount sufficient to impart brightness to the electro-deposited metal.

Bright Nickel Bath

U. S. Patent 2,800,440. July 23, 1957. H. Brown, assignor to The Udylyte Research Corp.

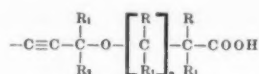
A bath for electrodepositing lustrous fine-grained nickel comprising

an aqueous acidic solution of at least one nickel salt selected from the group consisting of nickel sulfate, nickel fluoborate, and nickel sulfamate, said bath also containing dissolved therein an alkyne sulfonic acid having 3-14 carbon atoms inclusive, the alkyne radical of said sulfonic acid consisting of atoms selected from the group consisting of carbon, hydrogen, oxygen, chlorine and bromine and said alkyne radical being selected from the group of radicals consisting of unsubstituted alkynes, alkanoxy alkynes, hydroxy alkynes, ester substituted alkynes, chlorine substituted alkynes, bromine substituted alkynes and alkanoxy carboxylic alkynes, said acid being present in a concentration of about 0.01 gram/liter to 20 grams/liter.

Bright Nickel Bath

U. S. Patent 2,800,441. July 23, 1957. H. Brown and R. J. Clauss, assignors to The Udylyte Research Corp.

A bath for electrodepositing bright nickel comprising an aqueous acidic solution of at least one nickel salt selected from the group consisting of nickel sulfate, nickel chloride, nickel fluoborate and nickel sulfamate, said bath also containing dissolved therein about 0.005 to about 2 grams/liter of at least one alkynoxy alkane carboxylic acid having a total of 5 to 15 carbon atoms in which the unsaturated triple bonded carbon to carbon linkage is separated from the carboxyl group by 2 to 4 inclusive carbon atoms and 1 intermediate oxygen atom, and containing the grouping,



in which R is selected from the group consisting of hydrogen, methyl, carboxyl and carboxymethyl radicals, R_1 is selected from the group consisting of hydrogen and methyl radicals, R_2 is selected from the group consisting of hydrogen, methyl and ethyl radicals, and n is not greater than 1 and in conjunction therewith about 0.1 gram/liter to saturation of at least one brightener selected from the group consisting of benzene, diphenyl and naphthalene sulfonic acids, benzene sulfonamides and sulfonimides and dibenzene sulfonamides and sulfonimides and the halogenic, methyl, aldehyde derivatives of said sulfonic

acids, sulfonamides and sulfonimides, and beta unsaturated alkene sulfonic acids having 4 to 2 carbon atoms.

Bright Nickel Bath

U. S. Patent 2,800,442. July 23, 1957.
H. Brown, assignor to The Udyllite Research Corp.

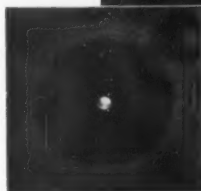
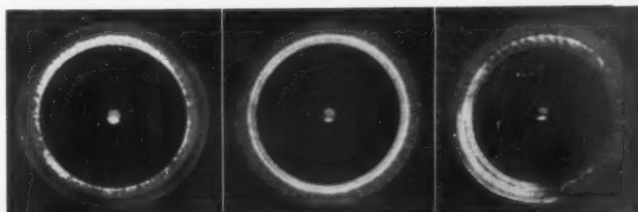
A bath for electrodepositing lustrous fine-grained nickel comprising an aqueous acidic solution of at least one nickel salt selected from the group consisting of nickel sulfate, nickel chloride, nickel fluoroborate and nickel sulfamate, said bath also containing dissolved therein an unsaturated sulfonic acid having 3-14 aliphatic carbon atoms inclusive selected from the class consisting of aryl alkyne sulfonic acids and alkyne aryl sulfonic acids containing one to two aryl groups selected from the class consisting of phenyl, biphenyl, and naphthyl groups, the aryl alkyne radical of said sulfonic acid consisting of atoms selected from the group consisting of carbon, hydrogen, oxygen, chlorine and bromine and said aryl alkyne radical being selected from the group of radicals consisting of unsubstituted aryl alkynes, alkanoxy aryl alkynes, chlorine substituted aryl alkanoxy alkynes, bromine substituted aryl alkanoxy alkynes, methoxy substituted aryl alkanoxy alkynes, and alkanoxy aryl hydroxy substituted alkynes, said sulfonic acid compounds being dissolved in the baths in a concentration of about .005 to about 4 grams/liter.

Method of Chromium Plating

U. S. Patent 2,800,443. July 23, 1957.
J. E. Stareck, E. J. Seyb, Jr., and Frank Passal, assignors to Metal & Thermit Corp.

A method for reducing the loss of fatigue strength following chromium plating of an article of hard steel comprising electrodepositing chromium on the article by passing a current of $\frac{1}{4}$ to 5 a.s.i. to said article as cathode in an aqueous chromium plating bath at a temperature of 90 to 110°F., said bath having a CrO_3 content of 100 to 400 g./l. and containing dissolved sulfate, $\text{SO}_4^{=}$, as catalyst, the ratio of CrO_3 to dissolved sulfate being 100:1 to 40:1, plating chromium on the article to form a deposit at least 1 mil thick, said deposit being characterized by having at least 1,000 crack-lines per inch and a stress below +5,000 p.s.i.,

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rubber companies. Tests have been conducted for several years on products finished with Armohide. The results of these field tests conclusively showed that Armohide is superior in every respect to the highest quality baked enamels; so superior in fact that it could be compared only with the expensive vinyl and leather laminated on metal.

Thus Armohide is a new and entirely different kind of finish with physical and chemical properties unlike any other finish now on the market.

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and thereby producing a chromium plated article of hard steel having a fatigue strength of at least 60% of that of the original unplated steel.

Hot Dip Aluminum

U. S. Patent 2,800,707. July 30, 1957.
M. G. Whitfield and V. Sheshunoff, assignors to Whitfield & Sheshunoff, Inc.

A method of forming a high strength bond between a ferrous metal body and a coating of aluminum which comprises coating the surface of the ferrous metal body with a barrier metal chosen from a class consisting of molybdenum, tungsten and mixtures thereof and dipping the ferrous

body into a bath of molten aluminum.

Cleaning Table

U. S. Patent 2,800,995. July 30, 1957.
E. R. Zademach, assignor to Metalwash Machinery Co.

A treating apparatus comprising an annular treating chamber having stationary inner and outer peripheral walls, a rotary table conveyor supported in said chamber, a vertical suspending wall connected to said conveyor rotating in said chamber with said conveyor, conveyor drive means extending through the inner wall of the chamber, said vertical suspending wall being co-extensive with the inner peripheral margin of said rotary conveyor,

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upper support means affixed to the inner wall of the chamber engaging the upper portion of the vertical suspending wall and lower support means affixed to the inner wall of the chamber engaging the lower portion of the conveyor.

Copper Backed Mirrors

*U. S. Patent 2,801,935. Aug. 6, 1957.
J. T. Owen, assignor to Merck & Co., Inc.*

In the art of making mirrors and the like wherein silver is chemically deposited on a non-conductive surface, the improvement which comprises treating the silvered surface simultaneously with a solution of a copper salt, sodium-potassium tartrate and alkali and a solution of a tartaric acid salt of hydrazine as a reducing agent, to form a copper backing over the silvered surface which covers pin-holes in the silvered surface and provides a durable backing therefor without injury to the silvered surface.

Antimony Bath

*U. S. Patent 2,801,959. Aug. 6, 1957.
A. H. Du Rose, assignor to The Harshaw Chemical Co.*

An alkaline antimony electroplating solution comprising, in addition to water, antimony complex material selected from the class consisting of sodium antimony tartrate, sodium antimony gluconate and mixtures thereof, the sodium salt of a hydroxy acid of the class consisting of tartaric acid and gluconic acid, and sodium hydroxide, the concentration of antimony (Sb) being from 20 to 90 grams per liter, and the ratio of gram equivalent weights of alpha hydroxyl to the gram atomic weights of antimony being from 4:1 to 8:1, and the concentration of sodium hydroxide being sufficient to produce a pH value from 8.5 to 13.0.

Silver Tarnish Removal

*U. S. Patent 2,801,961. Aug. 6, 1957.
H. R. Treece, assignor to The Design and Research Center for the Gold, Silver, and Jewelry Industries.*

A method of detarnishing articles comprising silver and a secondary metal in which the surfaces of said articles have exposed thereon both silver and secondary metal, without tarnishing the exposed secondary metal, comprising: immersing said articles in an aqueous solution which will not materially attack silver, said

solution having dissolved therein an acid stronger than hydrosulphuric acid and at least 1% by weight of a compound selected from the group consisting of thiourea and thiosemicarbazide capable of forming a soluble complex with silver ions in aqueous solution; and imparting to said articles negative electrochemical characteristics during the de-tarnishing operation.

Gold Bath

*U. S. Patent 2,801,960. Aug. 6, 1957.
R. Seegmiller, assignor to the United States of America.*

A plating solution for gold plating consisting essentially of about 15 to about 50 grams of gold cyanide, of about 70 to about 125 grams potassium cyanide, and of about 0.1 to about 10 cc. of sulfonated castor oil per liter of aqueous solution.

Acid Pickling Inhibitor

*U. S. Patent 2,801,979. Aug. 6, 1957.
K. F. Hager, J. M. Michel and M. Rosenthal, assignors to the United States of America.*

An acid bath for pickling ferrous metals containing as an inhibitor to repress its etching and air-corrosive properties towards said metals between about 0.01 and 0.1% of its weight of a compound having the formula $R_1-SO_2-NH-R_2-COOR_3$ in which R_1 is a saturated aliphatic radical with a chain length of from 12 to 18 carbon atoms, R_2 is a member of the group consisting of aryl radicals and alkyl radicals of the formula $-C_nH_{2n}-$ where n is a small positive integer and R_3 is a member of the group consisting of hydrogen, alkali metal, ammonium and cyclohexylamine ions.

Polishing Device for Deeply Curved Surfaces

*U. S. Patent 2,802,311. Aug. 13, 1957.
W. E. Linden and W. E. Lennon, assignors to Utica Drop Forge & Tool Corp.*

A polishing machine for polishing curved surface workpieces, comprising a first and second track system and a first and second abrasive ribbon directed by said first and second track system respectively against the curved surfaces, whereby polishing action is accomplished by lateral movement of the ribbons in surface contact with the workpiece as the workpiece is recipro-

cated in a fixed path between the moving ribbons.

Abrasive Wheel

U. S. Patent 2,802,315. Aug. 13, 1957. A. Block, assignor to Merit Products, Inc.

A multiple abrasive grinding wheel assembly comprising a plurality of abrasive grinding wheels, each of said wheels having a plurality of leaves attached at one end thereof to a central circular core, the other ends of said leaves being free, each of said wheels having a pair of circular side strips attached on the opposite sides thereof, said side strips extending radially outwardly from said core.

Ultrasonic Degreaser

U. S. Patent 2,802,476. Aug. 13, 1957. T. J. Kearney, assignor to Detrex Corp.

In degreasing apparatus, a housing; a well within the housing containing liquid solvent such as trichlorethylene; a conveyor for carrying work to be cleaned from the exterior through the housing for submergence for a definite time interval in the solvent in the well; and means piezoelectrically generating ultrasonic vibrations at a zone within said solvent out of direct mechanical contact with said work to be cleaned and for subjecting the solvent and the work to ultrasonic vibrations during the period of submergence of the work in the solvent, said means including a piezoelectric transducer having an electrical conductor in direct contact therewith; and means for supporting said conductor and said transducer in direct contact with said solvent.

Silver Anode

U. S. Patent 2,802,782. Aug. 13, 1957. R. Bayes, O. W. Langhans and L. Greenspan, assignors to The American Platinum Works.

In an electroplating apparatus including a plating tank containing a supply of electrolyte, a homogeneous imperforate extruded silver anode having substantially bulbous enlarged edges, wherein the ratio of the thickness of the enlarged edges to the thickness of the plate is within the range of about 2:1 to about 4:3.

Ultrasonic Degreaser

U. S. Patent 2,802,758. Aug. 13, 1957. T. J. Kearney, assignor to Detrex Corp.

A method of cleaning a work object which comprises contacting and

treating the work object for a definite time interval with a chlorinated hydrocarbon solvent in a zone; removing said work object from said zone and submerging it in a bath of liquid chlorinated hydrocarbon, carrying said work object through a predetermined path through said liquid, piezoelectrically generating ultrasonic waves at a generating zone within said liquid out of direct mechanical contact with said work object, directing said waves toward said path for impinging upon said work object while it is being carried through said path, and subjecting said work object to said ultrasonic waves, said waves traveling freely and directly through the liquid between said generating zone and said work object.

Electrodeposition of Nickel and Nickel Alloys

U. S. Patent 2,802,779. Aug. 13, 1957. W. Cowle, D. E. Mansfield, P. Spiro and G. C. Wood, assignors to S. A. Vickers Limited.

An electrolytic bath for use in the electrodeposition of a metal selected from the group consisting of nickel and nickel-base alloys which comprises an aqueous solution of a nickel salt selected from the group consisting of nickel sulphate and nickel sulphamate and an inorganic chloride selected from the group consisting of sodium chloride and potassium chloride, in which the amount of nickel salt is equivalent to a nickel concentration of at least 3.0 ozs. per gallon and the amount of inorganic chloride is approximately eight times greater by weight than the amount of nickel present in the nickel salt.

Gyrofinishing

U. S. Patent 2,803,093. Aug. 20, 1957. W. F. Diehl and R. D. Purcell, assignors to General Motors Corp.

Apparatus for surface finishing articles comprising a cylindrical container having a horizontally disposed longitudinal axis and containing loose abrasive material, means for rotating said container on its longitudinal axis to cause movement of said abrasive material, and a work carrier projecting into said container to transport the articles to be finished through said abrasive material in a substantially straight line angularly disposed to the movement of said abrasive material.



SLASH SLASH YOUR WATER BILLS... SOLU BRIDGE Automatic RINSE TANK CONTROLLER

Yes, water savings frequently greater than 50%! An Eastern gold-plating plant, for instance, has reduced its water bill by a rate exceeding \$10,000 per year. And because of serious water shortages in many areas, as well as Federal Law No. 845 (making stream pollution a Federal responsibility), there is sharply increased interest in the batch treatment of collected rinse waters.

Installation comprises (a) Conductivity Cell placed in rinse tank; (b) Solu Bridge Controller automatically actuating (c) Solenoid Valve, for any preset degree of rinse.



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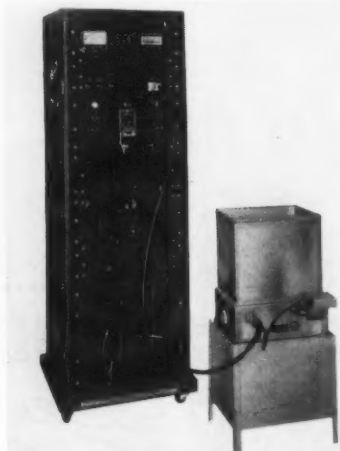
Recent Developments

NEW METHODS, MATERIALS AND EQUIPMENT
FOR THE METAL FINISHING INDUSTRIES



Ultrasonic Cleaner

*Alcar Instruments, Inc., Dept. MF,
17 Industrial Ave., Little Ferry, N. J.*



A new ultrasonic cleaner unit for small part cleaning, blind hole washing, printed circuit cleaning and other difficult cleaning operations, delivers 2 kilowatts of power to magnetostrictive transducers welded into the bottom of the stainless steel tank. Dimensions of the tank are 9" x 14" x 13" deep. It holds 5 gallons of liquid. Water cooling of the nickel transducers allows the use of cleaning solutions up to 450°F. A water flow switch prevents accidental operation without cooling water flowing. Also provided is a 0-15 minute timer which shuts off the generator at a predetermined time. A switch is provided for by-passing the timer to permit continuous operations.

The 2 kilowatt generator and 9" x 14" x 13" ultrasonic cleaning tank are available either rack mounted (as shown) or in matching bench-type cabinets.

68/Circle on Readers' Service Card

Sodium Copper Cyanide

*Electrochemicals Dept., E. I. du Pont de Nemours & Co., Inc., Dept. MF,
Wilmington 98, Del.*

Sodium-copper cyanide double salt

for use in copper plating solutions formulated with sodium cyanide has been established as a regular product by the above manufacturer.

Use of sodium-copper cyanide double salt by electroplaters facilitates the make-up or replenishment of plating solutions by eliminating the several steps required to dissolve copper cyanide properly. Its use also reduces handling of chemicals, avoids errors in make-up or replenishment of the plating bath and, because of its high purity, results in a high-quality finished product, it is claimed.

69/Circle on Readers' Service Card

Acid Copper Addition Agent

*The Seymour Mfg. Co., Dept. MF,
Seymour, Conn.*



In the 0.030" thick example (left) note smooth deposit. The 0.016" plate (right) deposited in an ordinary acid copper bath solution, reveals a rough, granular surface with nodular build-up along edges.

Smooth surface copper plating to any thickness can be achieved with CuSOL, a new addition agent for acid copper solutions.

The process is claimed to eliminate roughness, treeing and nodular build-up which occur in ordinary acid copper baths, making it particularly useful for electroformed molding operations. Since the acid base does not affect the lam-

inate boards, it can also be recommended for printed circuit manufacture.

The new addition agent is usable up to 15 days without replenishment in any normal cold or warm acid copper bath. The resulting fine grain copper deposit not only makes for smoothness and ductility but ends flaking and cracking. A 0.030" copper plate has the same ductility and elongation as 0.016" plating accomplished through ordinary acid copper solutions. Current density range is wide, from 5 to 280 amps./sq. ft.

70/Circle on Readers' Service Card

Anode Basket

*Equipment Div., Wagner Bros. Inc.,
Dept. MF, 7800 Dix Road, Detroit,
Mich.*

Hang-up of anodes employed in plating operations is completely eliminated through use of a new type anode container. Of welded construction, the container is of the "basket" type with its vertical members and supporting rings arranged to provide maximum weight distribution in supporting the heavy metal anode loads.

Other construction features of the container include double spacing of





Plating Progress



Published by SEL-REX CORPORATION

FEBRUARY 1958

NUTLEY 10, NEW JERSEY

No. 1



New Acid Gold Improves Printed Circuits Plating

The perfection of a new Acid-Type Gold Plating Process (ph 3.5-4.5), is expected to be exciting news to manufacturers and platers of printed circuits. Developed specifically for this exacting application, the process' electrolyte is mildly acidic so that neither the laminate nor the adhesive at the interface of printed circuit boards is affected during plating.

Other advantages offered by the new Sel-Rex Acid Gold Plating Process include: operates at room temperature—no hot solutions to damage even the least expensive paper or micarta printed circuit baseboards; approximately 75% greater resistance to abrasive-wear over

conventional Gold Plate; mirror-bright, fine grained, uniformly distributed plate—regardless of thickness; solution is simple to prepare and easy to maintain.

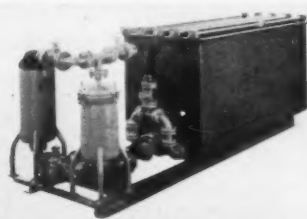
The new process also eliminates the need for a conventional "gold strike," thus avoiding damage to the photo resist on printed circuit boards by exposure to a warm cyanide solution.

A technical paper with complete details on bath preparation and control, equipment required, charts on physical properties, etc., is available free for the asking.

Volume Electroplating "Plant" In One Compact Package

Tested and perfected under actual operating conditions by electrical and electronic components manufacturers, the Sel-Rex Industro-Pak Plater was found to permit volume-production in a compact, uncluttered cabinet, while maintaining highest quality plating.

One of the country's leading volume-producers of printed circuits and components installed the Industro-Pak Plater illustrated here, for plating with tin fluoroborate. The unit consists of a 500 gallon steel tank, coated with 3/16" thickness of special vulcanized rubber. A jet orifice manifold at the bottom of the tank provides continuous turbulent flow of the plating solution for smooth, even deposits. Continuous or intermittent filtration is afforded by the built-in filter and slurry tank.



Sel-Rex Industro-Pak Platers are custom-engineered to the specific application, completely bussed with anode and cathode bars in required amperage capacities. Units are available for room temperature plating, or equipped with heating coils.

Heavy Copper Deposits Produced At High Speed Are Tree-Free And Highly Ductile

The new CuSol Acid Copper Plating Process* permits faster, smoother, more ductile deposits than any other commercially practical method. Consisting of two simple addition agents, CuSol may be used to convert existing sulphate or fluoroborate copper plating baths, as well as to make up original baths.

Advantages of the new process include: exceptional throwing power permitting evenly-distributed deposits even in "blind" holes and crevices; highly ductile deposits—buffs as easily as Gold;

no un-even build-ups or "trees," not even in heavy electroforming—eliminates periodic reverse or "de-plating" methods; and operable in a wide range of current densities—5 asf to 280 asf—adjust speed of deposition to conform with your specific requirements.

ATTENTION PRINTED CIRCUIT PLATERS—CuSol's Acid base cannot affect laminate boards, as do cyanide base solutions.

*A patented process of the Seymour Manufacturing Company

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- ☐ RX-2 • Rhodium Electroplating Processes—12 pages, demonstrations & charts
- ☐ IP-3 • High Volume Plating Plant in Small Cabinet—Industro-Pak Plater
- ☐ AC-4 • CuSol Acid Copper Process, tree-free heavy deposits—technical report

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- ☐ BR-a • Gold Plating, Industrial & Decorative, by E. C. Rinker—8 pages, illustrated
- ☐ FD-b • Gold Plating in Electronics by Federal Telephone & Radio—4 pages, illustrated
- ☐ SX-c • Silvex Bright Silver Plating (Patented)—technical data, 13 pages

NOTE: For your convenience, when requesting the literature you want, simply refer to it by the prefixed code.

vertical members at the lower portion of the unit, and reinforced bottom. The container bottom is reinforced both by an extra heavy steel ring, and an angle type spine which bends under the bottom, and runs the full length of the container to end up as a hook at the top.

The new container is manufactured in lengths to meet each user's requirements, and in standard diameters of 2¼ inches. It also is produced with double hooks of ¾-inch square bar with knife-edge contacts.

72/Circle on Readers' Service Card

Dust Collector

Hammond Machinery Builders, Inc., Dept. MF, 1601 Douglas Ave., Kalamazoo, Mich.

A new 53" high Junior Cyclone Dust-Kolector is available in two capacities, 400 cfm and 600 cfm, and operates on the same principle as the larger cyclone types, centrifugal precipitation and gravitation for the removal of larger particles. The latter are deposited in the removable receptacle in the base. Smaller particles are exhausted out-



Model JCB4

doors or trapped in a bag attached to the outlet. The bag is easily removed and equipped with a zipper for quick cleaning. With the bag style, the air is recirculated and heat is thus saved.

To prevent clogging of blower wheel, even when sticky or stringy materials are being collected, the wheel is mount-

ed on the exhaust side rather than the inlet side. Also, the wheel is a self-cleaning, paddle type, and is dynamically balanced to minimize vibration.

The unit requires a minimum of floor space and can be "tucked in" almost anywhere. Additional floor space can be conserved by turning bag with the longer portion upward, with the bag being supported by a rod. Casters can also be inserted in the base to make the unit portable. 400 cfm models operate on ½ h.p. motor and 600 cfm units require a 1 h.p. motor.

73/Circle on Readers' Service Card

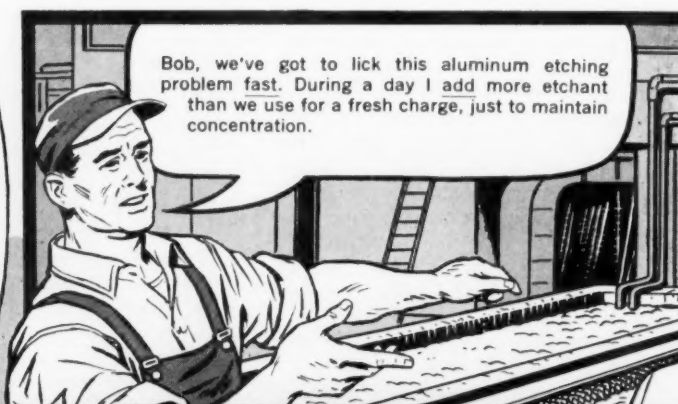
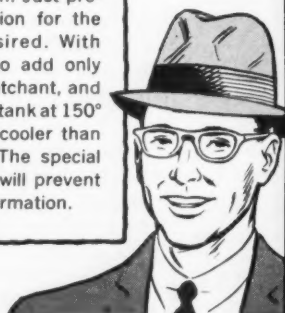
Brush Plating Solutions

Dalic Metachemical Ltd., Dept. MF, 121 Judge Road, Toronto 18, Ont., Canada.

New solutions have been developed to allow tin and lead to be plated singly, or in combination, in any proportion of value to the user. High-lead content alloys (93 per cent) are suitable for bearing applications; 60-40 tin-lead alloys are ideal for components requiring subsequent soldering. These and any intermediate percentages for

Soft, Satin Etch...
at a \$5,500⁰⁰
annual saving!

No worries there, Bob. AE-16® gives a soft satin etch. Just prepare the concentration for the degree of etch desired. With AE-16, you'll have to add only about half as much etchant, and you can operate your tank at 150° to 170° F. . . much cooler than you've been using. The special ingredients in AE-16 will prevent sludging and scale formation.



Bob, we've got to lick this aluminum etching problem fast. During a day I add more etchant than we use for a fresh charge, just to maintain concentration.

THE FOLLOWING MONTH...

Morning, Bob. Bet you the AE-16 etchant is still working as smoothly as the first week!

Is it! Here, read my report. We dump every two weeks now. We've cut consumption from 25 drums, to 12 drums a month. This year we'll save more than \$5,000 on chemical costs alone.

special purposes are readily achieved merely by mixing the solutions in proper volumetric proportions.

Both the new Dalic plating solutions are slightly alkaline, the tin having a pH of about 7.5, the lead ranging between 8.0 and 8.5. They will not set up corrosion cells, will not cause embrittlement, and do not attack different neighboring metals.

The tin and lead electrolytes were designed specifically for use with the company's selective area plating equipment.

74/Circle on Readers' Service Card

Spray Gun

Binks Mfg. Co., Dept. MF, 3122 Carroll Ave., Chicago 12, Ill.

"Bleed-off" costs during color changes are cut 65% by a new spray gun for circulating systems, it is reported. The Model 19J spray gun is completely purged with only a 2 to 4 fluid ounce bleed-off. Two internal design features are responsible for this paint savings. The amount of paint contained between material inlet to nozzle orifice is greatly reduced and all



pockets in the gun head capable of trapping paint are eliminated.

Offering the same paint savings as the one piece aluminum hand-operated gun is the automatic 21J spray gun. The latter is constructed of heavily plated deep forged bronze and is designed for use on automatic painting machines. Both guns have standard 3/8" material and 1/4" air inlets and are also available with 5/16" inlets.

75/Circle on Readers' Service Card

Plastic Coated Gloves

Jomac, Inc., Dept. MF, 6128 N. Woodstock St., Philadelphia 38, Pa.

North PVC-coated industrial gloves, said to be the most abrasive and chemical resistant and most flexible on the market, have just been introduced in the United States. They are claimed to resist virtually all chemicals and solvents encountered in industrial use, including acids, alkalis, fats, greases, oils, petroleum products, alcohols and waxes.

The gloves are furnished in a wide variety of styles for every requirement, including gauntlet, knitted wrist, ribbed surface and either fully coated or palm coated. They are available in a full range of men's and women's sizes.

76/Circle on Readers' Service Card

Explosion-Proof Remote Temperature Control

United Electric Controls Co., Dept. MF, 79 School St., Watertown, Mass.

The E95, an explosion-proof remote bulb temperature control, has recently been added to the manufacturer's

Don't I know it! And the way scale and sludge build up, we're dumping the solution every week. I'm going to try Pennsalt this time. Let's call Dick Goebner... he helped us lick a foam problem last month.

Bob, you've got a problem, all right, but I think I know how you can solve it. Pennsalt Aluminum Etchant 16 has proved to be the answer in a number of cases like yours.

OK, Dick, but don't forget we've got to maintain uniform etch for anodizing.

That's great, Bob...

And that's not all. On top of that, I figure using Pennsalt etchant saves us an easy \$100 every month on maintenance and heating costs. Do you realize AE-16 let us lower the temperature of the etch tank 30°?

Dick does realize it. It's part of the knowledge he brings to customers' problems. No matter what your metal (or your metalworking problem), Pennsalt service gives you "A BETTER START FOR YOUR FINISH."

Pennsalt Chemicals Corp.
Dept. 566, 3 Penn Center
Philadelphia 2, Pa.

Send information on Pennsalt ☐ Metal cleaners
☐ phosphate coatings ☐ cold-working lubricants

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Company _____
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For pickling and metal plating . . . wherever corrosive acids and other chemicals are used . . . Manhattan Rubber Linings give you the cost-saving protection you need. Manhattan engineers have developed a method of bonding multiple calendered sheets of rubber to metal so securely, mechanical pull tests prove they can't be separated! This means you get permanent protection against corrosion of your equipment . . . permanent protection against contamination of solutions used in processing. It's the kind of protection that has kept many Manhattan Rubber Lined tanks in continuous use for over 30 years!

Manhattan Rubber Linings won't harden, crack or oxidize . . . even under extreme changes in temperature. To assure lifetime protection, every tank lined by Manhattan is tested under high voltage to detect any possible imperfection before it is shipped to your plant. And Manhattan has the facilities to handle any tank that can be shipped. Let an R/M lining engineer show you why Manhattan Rubber Linings can assure you the protection you need for costly plating and pickling equipment. Contact the Manhattan rubber lining facilities nearest your plant.

RM 030

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78/Circle on Readers' Service Card

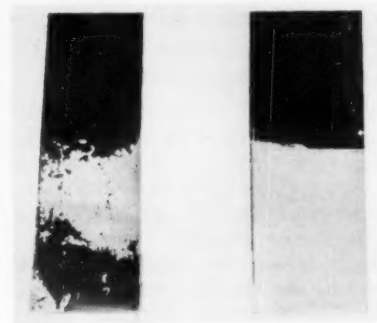
also permits the use of this control in Class I, Group C and D locations as defined by the National Electrical Code.

Switches are available in any one of three standard types: normally open, normally closed, or double throw with no neutral position, and are rated for 15 amps at 115 or 230 volts A.C. All switches are single pole and suitable for 130° F. ambient temperatures.

79/Circle on Readers' Service Card

Caustic Stripping Activator

Magnus Chemical Co., Inc., Dept. MF, South Ave., Garwood, N. J.



Stripping results without (left) and with (right) Activall addition.

Activall, a new additive, is claimed to increase the effectiveness of any alkaline stripping solution by decreasing stripping time, by making it possible to strip a finish which cannot be stripped by normal alkaline strippers or by combining stripping with rust removal. It is specifically recommended for industries confronted with the problem of refinishing or painting metals such as steel, cast iron, etc., which are inert to the action of strong alkalies.

The operations in which the material has been proven beneficial are stripping of hooks, stripping of rejects, stripping of metal parts prior to reconditioning and the effective removal of light rust deposits. Addition of the activator to alkaline stripping solutions is stated to increase the normal life of the stripping solution as well as the effectiveness of the stripper. Its ability to increase the speed of stripping also increases the number of parts per day that can be handled in a given tank.

80/Circle on Readers' Service Card

Spray Mask Washer

Deco Tools, Inc., Dept. MF, 4321 Harris St., Toledo 12, Ohio.

A semi-automatic mask washing machine, designated the Model '68', is



standard line of quality controls. This sensitive, compact unit is designed for use in hazardous locations where explosive vapors or gases are present.

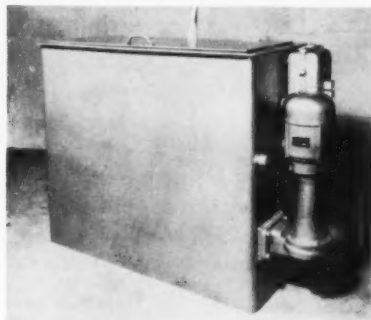
The unit is composed of two integral assemblies: the remote bulb thermal device and control head with connecting capillary tube of varying lengths.

Temperature settings are made with an external adjustment knob and calibrated dial. Models are available with adjustable range spans of 100° F. or 200° F. between the limits of -150° F. and 650° F. with on-off differentials of approximately 1° F. and 2° F.

Its new cast iron enclosure makes the device more compact and less expensive than previous models. Approximate weight is 5½ lbs. This enclosure

claimed to be the fastest and most inexpensive of its type on the market with no internal piping to clog or fill with paint residue. The machine has cleaned up to 25 coats of wet lacquer from a mask in 15 seconds, washing both sides of the mask with an impingement pressure of over 20 lbs. per square inch. The machine requires but 5½ square feet of floor space and 35 gallons of solvent for a complete charge, making it safer and more economical to operate.

The effective cleaning area of the standard model is 34" long x 15" high



x 12" wide and is constructed of 12 gauge steel with a nonferrous top finished in silver hammertone enamel. The overall size is 18" wide x 44" long x 36" high. Acetone, ketones, toluene, trichlorethylene, or any similar type solvent can be employed.

The pump is an Ingersoll-Rand side-mounted, seal-less, driven by a 220/440 volt, 3 phase, 60 cycle explosion-proof motor meeting all J. I. C. and Nema Standards for operations in hazardous areas.

81/ Circle on Readers' Service Card

Heat Resistant Paint

Products Development Corp., Dept. MF, 824 Connecticut Ave., N.W., Washington 6, D. C.

A new and durable paint for iron and steel and their alloys withstanding 1500° F., called Endura-temp, contains fine ceramic frits. Seventy-five per cent of the product are solids. It is sprayed, brushed or dipped on clean metal surfaces. Primers are not desirable. The paint air dries at room temperature to form immediately a tough weather- and corrosion-resistant coating. After drying, the coating adjusts to high temperatures, while in progressively hot usage. Afterward, it withstands thermal shock and other tests in Government Specification MIL-P-14105A, paint, heat resistant (1400° F.). One

gallon protects 600 sq. ft. from corrosion for a long time.

83/ Circle on Readers' Service Card

Air Filter

Arco Mfg. Corp., Dept. MF, 542 W. 55th St., New York 19, N. Y.

A new type of air filter, known as the pure-air filter, consists of a disposable filter pad made of synthetic fibers and a cadmium plated metal holding frame. The filter pads are completely free of any oil or adhesive, and are available in various efficiencies. The pads are easy to change; simply pull out retainer ring, remove dirty filter pad, install clean filter pad, replace retainer ring.

The pads are claimed to be more



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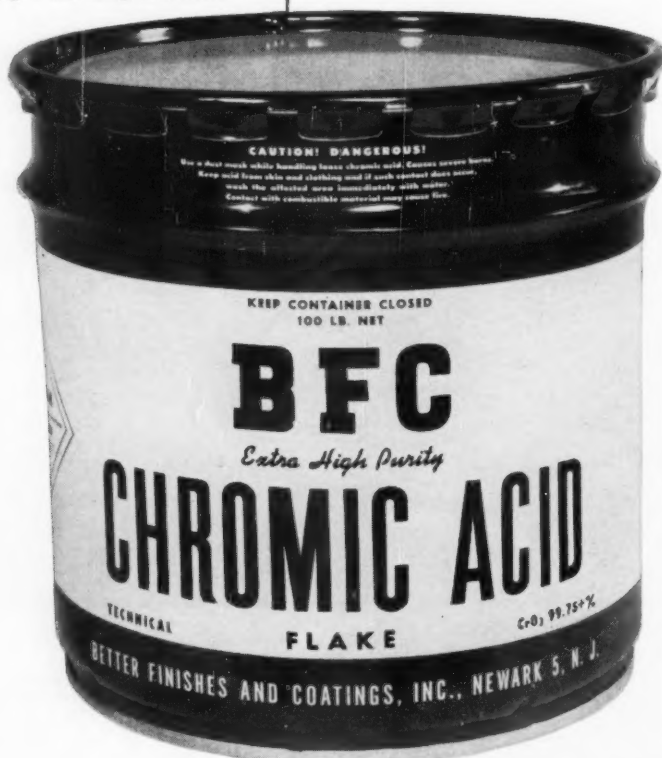
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82/ Circle on Readers' Service Card

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84/Circle on Readers' Service Card

efficient than conventional viscous coated filters and the replacement pads costs less than fiberglass filters. They are light in weight (about 1 oz. each pad). This reduces freight, handling and storage costs.

85/Circle on Readers' Service Card

Graphite Heat Exchanger

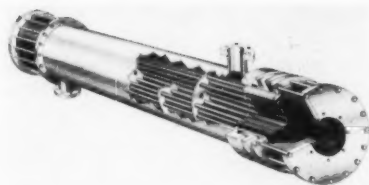
Falls Industries, Inc., Dept. MF,
Aurora Road, Solon, Ohio.

The Impervite tube and shell type heat exchanger is now furnished with an improved design which keeps the impervious graphite in the floating end under constant compression.

The floating end of the exchanger is composed of an impervious graphite

tube sheet, which accepts the tubes of the exchanger, and an impervious graphite dome which directs the flow of the tube side fluid. A metal skirt is placed around the tube sheet. This skirt is formed with a shoulder at the rear of the tube sheet, and a recess at the front. Into this recess is positioned a split ring which, in turn, accepts a retaining ring, and is bolted to the face plate located at the extreme front of the exchanger and on the forward end of the impervious graphite dome. This arrangement permits all of the impervious graphite at the forward end of the exchanger to be held in positive compression between heavy steel plate.

It is claimed that this new design



imparts greater strength to the floating end of the exchanger, and provides for a more positive packing between the machined metal surfaces of the tube sheet skirt and the shell flange.

The heat exchangers are furnished in two standard tube pitches which provide a selection of over 125 standard models in capacities from 7½ to 2300 square feet of heat transfer surfaces are available on special order.

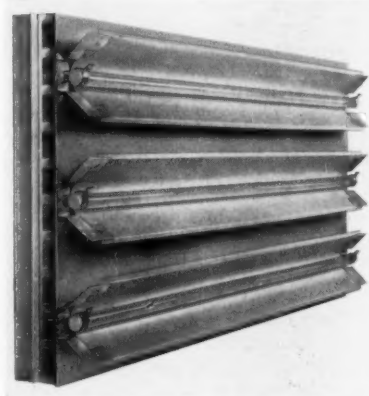
86/Circle on Readers' Service Card

**Infra-Red Radiant Heating
Units**

Douglas C. Whitaker Co., Inc., Dept.
MF, 141 E. Glenside Ave., Glenside, Pa.

A new line of tubular infra-red radiant heaters for use in ambient temperatures up to 1000° F., called "Vikoray," is available in both panels and individual tubular elements completely wired and ready to be erected and connected for use. The units come in both 120 and 240 volt but can be wired in series for use with 480 volts if desired.

The line ranges in wattage from 500 watts up to panels of 36 kw. Size range extends from 11 inches to 48 inches. The standard wave length is said to be



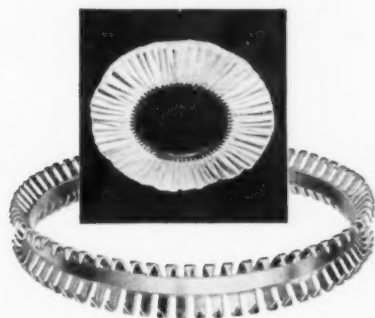
suitable for most applications, but the company also makes the units in special or modified wave lengths to meet special requirements. The units are guaranteed against "burn out" for one year.

87/Circle on Readers' Service Card

Clinch Rings for Buffs

American Buff Co., Dept. MF, 2414 S. La Salle St., Chicago 16, Ill.

Buff clinch rings with gripping power never before possible are now produced as a result of perfection of a projection welding procedure with important advantages over previous spot welding techniques. An improved



method of die-forming clinch-ring teeth is also used to produce teeth 25% larger than heretofore. These two new features are claimed to triple the strength of the rings and provide such a secure grip that both bias type and unit type buffs can be manufactured of heavier fabrics than ever before possible. The larger, stronger teeth assure greater buff "mileage" without pullout or risk of broken teeth.

The new clinch rings are now standard equipment on all the above firm's buffs.

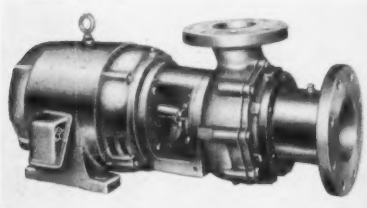
88/Circle on Readers' Service Card

Suction Pump

Aurora Pump Div., New York Air Brake Co., Dept. MF, 141 Loucks St., Aurora, Ill.

End suction type BC general purpose pumps can be furnished in close-coupled horizontal, flange mounted vertical, base mounted vertical, and pedestal mounted horizontal units. Range of sizes is 1/4 h.p. to 40 h.p. at 3,500 r.p.m.; 1/4 h.p. to 20 h.p. at 1,750 r.p.m.

These pumps possess low NPSH characteristics to meet critical suction



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The experience gained in over 70 years of machinery building has provided us with a big bank of "Know How."

This knowledge is drawn upon and added to every day. Our business is to share it with you to bring down high finishing costs. Many users of Hammond Automatics have found more efficient means of finishing by drawing on our bank of "Know How."

The Rotary Automatic illustrated represents one of our many types and sizes of automatic finishing machines for either continuous rotation or indexing. The head and stand units shown are a part of a large "family" which range in type and size up to 20 HP.



SEND SAMPLES and we will show you how much you can speed up production and cut costs.

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89/Circle on Readers' Service Card

conditions. They may be readily changed from packing to seals by means of interchangeable inserts — (a) mechanical seal, (b) packing, (c) water cooled stuffing box with mechanical seal and (d) water cooled packing box. Shaft sleeves are of bronze, case wearing rings of nickel-iron. Wide gasket seals prevent leakage between casing and mating parts.

90/Circle on Readers' Service Card

Severe-Duty Varnish

Marblette Corp., Dept. MF, 37-31 Thirtieth St., Long Island City 1, N. Y.

A protective epoxy varnish to guard metals and other materials from severe heat and corrosion hazards, designated Maraset clear varnish BV-790, adheres

firmly to cleaned and dried surfaces on which it is brushed or sprayed. After a heat cure of 20 minutes or longer, it sets completely to form a thin but tough and flexible coat which resists abrasion and chipping, and maintains chemical resistance at temperatures as low as minus 60° and as high as 200°. It is used as a single-component protective system, requiring no catalyst addition prior to cure.


91/Circle on Readers' Service Card

Air Make-up Unit

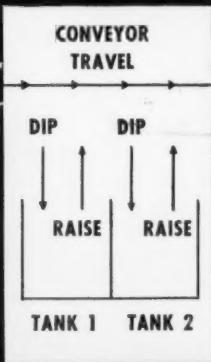
Aerovent Fan Co., Inc., Dept. MF, Piqua, Ohio.

Designed to temper outside air and supply it in sufficient quantities to eliminate negative pressures, this new

CLEANING or PICKLING...
PRODUCTION
And **RESULTS UP**



FLOOR SPACE
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with **Cincinnati** AUTOMATIC DIP-PROCESSING

If you're interested in dip-processing cleaning or pickling in *minimum space*, here's a production-proved solution that saves time, floor space and processing solutions. Straight-up, straight-down dipping of parts baskets traveling on a closed loop monorail conveyor means smallest possible tanks, important savings in floor space, too.

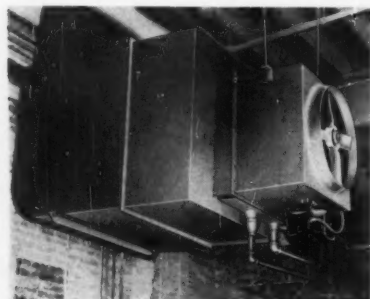
The operation is completely automatic, from first dip through conveyor unloading, can be used for any dip-processing sequence. In pickling processes, stainless steel, lead or rubber-lined tanks are provided.

For more information on this or a complete range of equipment for metal cleaning and finishing, write to: Cincinnati Cleaning and Finishing Machinery Co., 2027 Hageman St., Cincinnati 41, Ohio.

92/Circle on Readers' Service Card

air make-up unit supplements the normal heating system by relieving the infiltration heat load.

Wherever exhaust fans are used, there must be an adequate supply of air to insure proper operation of the



exhaust system, or a semi-vacuum is created. The unit corrects these conditions by replacing exhausted air with clean, fresh, pre-heated air.

Units are available in seven unit arrangements, in six sizes from 24" to 54", with air capacities ranging from 4000 CFM to 33,000 CFM. The basic unit consists of a fan and coil assembly with the fan mounted in a plenum on the discharge side of the coil. The advantage of this design is an even distribution of air velocity over the face of the coil, and a uniform discharge air temperature, resulting from the mixing of air in the plenum between the fan and the coil.

This unit may, with standard acces-

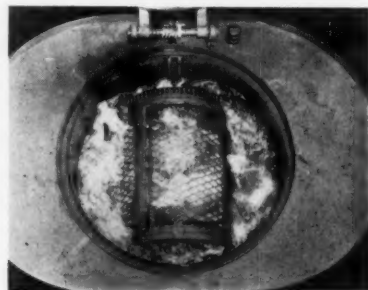
sories, be used as a unit heater, or as a source of filtered air for ventilation. Other accessories make it readily adaptable to either wall or roof installation. High-velocity recleanable filters are built into intake heads of roof-mounted units, or installed in filter cabinets on units employing wall inlets. Motor-operated shutters, supplied for all units, close automatically when the fan stops.

93/Circle on Readers' Service Card

Cleaning Machine

Argosy Industries, Inc., Dept. MF,
 67 May Court, Chagrin Falls, Ohio.

A new degreaser, the J. P. Whirlpool



industrial cleaner is designed to use caustic or detergent as the cleaning agent, and actually creates a "whirlpool" action which quickly removes and traps dirt and accumulations in a matter of minutes.

This unit employs power driven propellers to achieve exceptionally high speed fluid velocity and centrifugal force agitation which can also be used to strip paint, varnish and gum. It comes in 75-2000 gallon units able to accommodate parts of almost any size and shape. Secret of the rapid cleaning ability of the machine is the unique engineered design which quickly removes all foreign substances from contact with the chemical solution.

Each of the ten standard models now available uses any of the customary methods of heating the washing solution: gas, steam, electricity, oil.

94/Circle on Readers' Service Card

Phosphating Cleaner

Bell-Ray Chem. Corp., Dept. MF,
 3132 W. Garfield Ave., Milwaukee 8,
 Wis.

An improved modification of Chem-Bond, a phosphating cleaner, is distinguished by still better rinsability. It is also claimed to impart to coatings a superior impact-resistance. A further advantage is that ferrous metals, zinc-base die castings, galvanized iron, aluminum, copper, and brass, can all

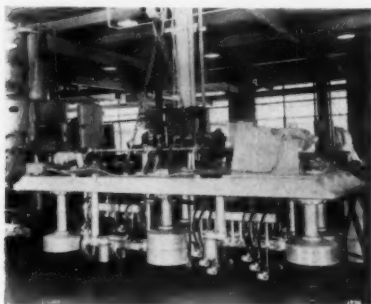
be cleaned and phosphated using the same solution.

95/Circle on Readers' Service Card

Liquid Abrasive Blasting Machine

Lewis Welding & Engineering Corp., Dept. MF, Bedford, Ohio.

A new automatic machine uses a liquid abrasive process to give a microscopically smooth finish. Two unique features are the completely novel, automatic method of handling the parts during the abrasive process, and an entirely new type of oscillating



Internal Mechanism of New Liquid Abrasive Machine

air blasting gun which is fed by an infinitely variable pump. The liquid abrasive or "slurry" is supplied to the gun in any predetermined mixture.

The process handles different sized components with ease. This is achieved by means of two interlocking sets of moving rubber belts. The piece to be finished is grasped between the first set of belts in such a way as to permit most of the surface to be exposed to the high pressure spray from the oscillating guns. As the first part of the cycle is completed, the second set of belts picks up the piece on its finished portion and carries it through a second spray area.

After the blasting operations are completed the pieces pass through a rinse compartment where all the sand particles are completely removed.

The rubber belts grasp the piece with just enough force to hold it rigidly without damaging the surface of the metal or distorting the inherent shape, and the double set of belts permits one continuous surface finishing operation.

The air nozzle and the water nozzle are mounted in the gun body in such a manner that the relative position of the two nozzles can be adjusted, the size of each nozzle can be selected for the particular type of material to be

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blasted, the air pressure can be regulated independently of the slurry flow, and the volume of slurry flowing from the water nozzle can be independently regulated at the slurry pump. As an additional feature, since the air nozzle is removable, any one of a variety of nozzle forms and shapes can be employed to produce the blast pattern most suitable for the particular size and shape of the workpiece.

97/Circle on Readers' Service Card

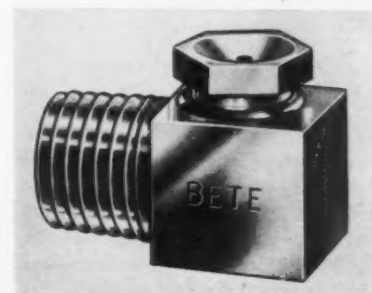
Whirl Nozzles

Bete Fog Nozzle, Inc., Dept. MF, 309 Wells St., Greenfield, Mass.

A new series of whirl type nozzles

called the "WT", atomizes the liquid through the use of a well known principle, the tangential whirl chamber.

The new nozzles have hollow cone spray patterns of 80° and are available in five standard models with flow rates





In constant use for 3¹/₂ years... and still going strong!

The Aluminum Finishing Co. of Indiana has used this titanium rack constantly for 3¹/₂ years. It shows no signs of wearing out! The company estimates that production and maintenance costs have been reduced 90%.

Order From Stock...at Less Than Mill Prices! Commercially pure titanium strips and sheets—available for immediate delivery—at prices that defy comparison! We've got all widths and lengths...thicknesses .020-.025-.032-.040-.051-.063-.080-.093.

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CHROME MOLY STEEL
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98/Circle on Readers' Service Card

from 0.1 to 0.5 gpm at 40 psi. Special models are available with narrower spray angles.

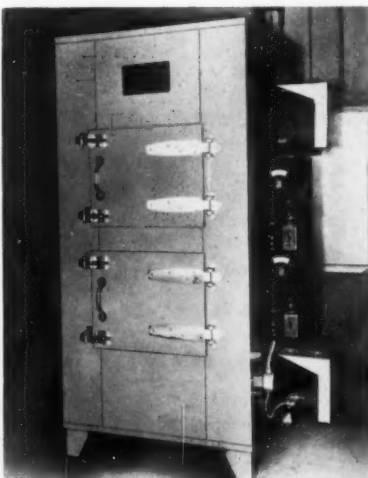
The nozzles are carried in stock in brass and made promptly to order in Teflon and other free machining materials, according to the manufacturer.

99/Circle on Readers' Service Card

Two Chamber Oven

Grieve-Hendry Co., Inc., Dept. MF,
1401 W. Carroll Ave., Chicago 7, Ill.

A new type of oven used for relief of hydrogen embrittlement on plated parts and stress relieving and normalizing of tools, springs, etc., has two chambers, each operating independently and having individual maximum op-



erating temperatures. Electric heating is standard, but it can be had with either electric or gas heating equipment.

The upper chamber has a 15 kw heat input capacity, with a maximum operating temperature of 1000°F. It also has a 720 cfm stainless steel interior and recirculating blower. Bottom of work space is 50" from floor. The lower chamber has a 6 kw heat input capacity with a maximum operating temperature of 650°F. This chamber has a 400 cfm recirculating blower. Bottom work space is 25" from floor. Common to both chambers is a work space 24" x 24" x 18" high, single doors, one control panel, and individual Partlow indicating and excess temperature controls.

The ovens are supplied completely assembled, having been previously tested and adjusted by the manufacturer.

100/Circle on Readers' Service Card

NEW BOOK

Metal Cleaning Bibliographical Abstracts

Published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 1957. 44 pages. Paper Cover. Price: \$2.00.

This 1957 supplement, contains over 225 new references including coverage of cleaning by ultrasonic means; cleaning stainless steels, and titanium; cleaning semi-conductors such as germanium. This book supplements METAL CLEANING BIBLIOGRAPHICAL ABSTRACTS, STP 90-B which covers the years 1842 to 1951; and the 1954 supplement, STP 90-C, which covers the years 1952 through 1954. This supplement, STP 90-D, brings the references up to 1956.

These abstracts are designed to make the published data on metal cleaning readily available to persons concerned with the production, finishing, and maintenance of metal products. This publication has been made possible by the intensive efforts of Jay C. Harris, in collecting, arranging and indexing the annotated references.

References are arranged by year, then by author or by journal if author is anonymous. References are numbered consecutively. In addition, the references are indexed by subject, author, specification and patent.

BUSINESS ITEMS

Pfaunder Appoints Payne



Burton S. Payne, Jr.

The Pfaunder Co. of Rochester, N. Y., has appointed **Burton S. Payne, Jr.** to head the metallurgical research and development group in the research division. A graduate of Rensselaer Polytechnic Institute, he joined the company in June 1956 as a metallurgist.

Payne is taking over the duties and responsibilities formerly held by **Richard E. Avery**, who is now doing quality control work on the staff of works manager **E. W. Zoller**. Payne is a member of the American Society of Metals, Acacia Fraternity, Tau Beta Pi and Phi Lambda Upsilon.

Heathbath Appoints Sales Representative

Heathbath Corp. announces the appointment of **International Chemical and Metallurgical Supply Corp.**, of Fort Lauderdale, Florida as their exclusive sales representative in Florida and Latin America for the sale of the complete line of heat treating and metal finishing products. Laboratory facilities and technical service will be made available through International Chemical for customers in that area.

Nordson Opens Eastern Branch

Nordson Corporation, formerly Bede Products Corp., announces the establishment of a new Eastern sales and service outlet at 477 Bergen Blvd., Ridgefield, N. J.

Named **Nordson Eastern Sales, Inc.**,

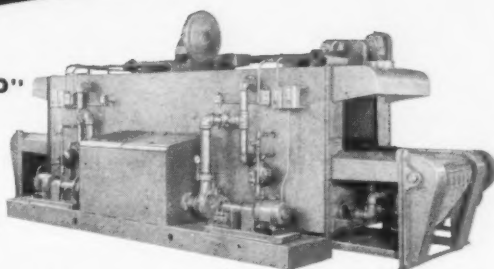
Why buy BLAKESLEE METAL PARTS WASHING and SURFACE TREATMENT MACHINES

"CONVEYORIZED"

"AUTOMATIC"

"MECHANIZED"

"AUTOMATION"



Many new words and phrases have been coined to describe modern production methods, one word in particular fits **BLAKESLEE**—

"FORESIGHT"

Over 40 years ago, before World War I, **BLAKESLEE** built a completely automatic power washer.

Because of this "foresighted design" many **BLAKESLEE** washers that were built over 30 years ago are still fulfilling time and motion requirements and modern automation needs. These machines are also mute testimony to **BLAKESLEE** quality and rugged construction which remains a basic requisite of all **BLAKESLEE** products.

Blakeslee Field Engineers are ready to help you with your metal cleaning problems. Why not call upon them!

G. S. BLAKESLEE & CO.

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also Manufacturers of Blakeslee Degreasing Machines and Blacosolv Degreasing Solvent

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the new company will function as sales and service center for airless spray painting equipment and paint heaters. In addition, the new facilities will provide for clinic demonstrations, testing of finishing materials as well as the servicing and repair of equipment.



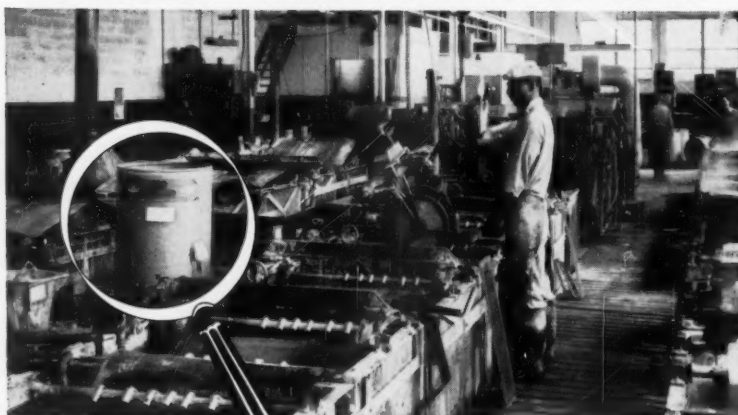
Joseph A. Sanches, sales manager of the new company, will direct its operations assisted by a thoroughly trained sales and service organization. Personnel working out of this office will have available portable airless spray coating systems for field demonstrations.

Badeusz Joins Wagner Bros., Inc.

Ben R. Badeusz, formerly assistant to the vice president in charge of manufacturing at Great Lakes Plating, Chicago, is the newly appointed sales representative in the greater Chicago area for **Wagner Brothers, Inc.**, Detroit manufacturers of chemicals, automatic plating and allied equipment.

Before joining Great Lakes, **Badeusz**

GOOD OPERATION



Cowles NS cleaner first... then barrel plating!

Our advertising agency looked in on this job plating shop with us one day and it didn't take a spyglass to find the Cowles NS drums. And it's no wonder, because this large plater* has been ordering NS and other Cowles cleaners by the truckload for years. He says NS speeds his operation . . . cleans the tough jobs as well as the easy ones . . . eliminates rejects.

As an extra convenience to truckload customers, Cowles ships palletized drums if requested . . . 4 drums per pallet.

*Metal Finishers, Inc., Cleveland, Ohio



CHEMICAL COMPANY

7014 Euclid Avenue • Cleveland 3, Ohio

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was assistant production manager for Kentile Co. Prior to that he was associated with Mall Tool.

Rhoades Promoted By United Wallpaper, Inc.

Walter F. Rhoades has been appointed vice president of marketing for United Wallpaper, Inc., Chicago, manufacturer of coatings and chemicals. Rhoades, who joined the firm in 1949, has been general manager of the DeSoto Paint & Varnish division, Garland, Texas, since 1954. Prior to that time he was technical director at the Pacific Paint & Varnish Division paint and resin laboratories at Berkeley, Calif. He has a broad background of technical, administrative, and sales experi-



Walter F. Rhoades

ence in the paint, resin, and printing ink fields.

Thomas Lester Appointed General Manager De Soto Paint & Varnish Co.



Thomas L. Lester

Thomas H. Lester was appointed general manager of the DeSoto Paint & Varnish Co., Garland, Texas, January 1, 1958. DeSoto is one of nine divisions of United Wallpaper, Inc., Chicago, which are located across the United States.

Lester succeeded Walter F. Rhoades, who was transferred to United's Chicago headquarters as vice president of marketing, a newly created position in the corporation.

36-year-old Lester joined the DeSoto division in January, 1952. He became successfully accountant, assistant office manager and finally controller of that division in August, 1952. In addition to the latter position he has functioned as assistant general manager and was an important factor in the successful move of the plant operations from Memphis, Tennessee, to Garland in April, 1952. Lester is a graduate of the University of Tennessee.

New Director of Sales for Biggs Company

Carl H. Biggs Co., Los Angeles, Calif., manufacturers of protective coatings, has announced the appointment of Davis Lott to the position of director of sales.

A graduate of Northwestern University, Lott, for the past four and a half years, was a director of the Chemold Co., Santa Monica, plastics manufacturers, where he served in various ca-

capacities in sales and advertising, being sales manager at the time of his resignation.

**U. S. Metal Coatings Co., Inc.,
Appoints E. V. Collins**

Appointment of *E. V. Collins* as plant manager has been announced by the *U. S. A. Metal Coatings Co., Inc.*, Middlesex, N. J., specialists in industrial plating of rolls and machinery parts.

Mr. Collins was formerly with the Chromium Corp. of America.

**Rack Manufacturer Appoints
Representatives and Distributors**

Service Screw Products Co., 131 N. Green St., Chicago 7, Ill., manufacturers of anodizing racks, announces several additional representatives and suppliers for its rapidly expanding line.

Lins R. Alt, 5316 Fernpark Ave., Baltimore, Md., *James J. Coughlin*, P. O. Box 7, Manchester, Mass., *Joseph A. Brislane Co.*, 3330 Olive St., St. Louis, Mo., and *H. W. Ressler*, 1348 N. 37th St., Milwaukee, Wis., have been confirmed as representatives in their respective areas.

Platers Research Corp. of New York, *Munning & Munning, Inc.*, of Newark and the *R. W. Renton Co.* of Cleveland have been appointed as suppliers to anodizing shops.

**Crown Rheostat Will Move
to Larger Quarters**

Crown Rheostat and Supply Company, of Chicago, plans to move into new quarters in Centex Industrial Park, Highway 83 and Pratt Blvd., Elk Grove Village, Ill., next summer. The new building will contain approximately 31,000 sq. ft. of warehouse and manufacturing area plus an additional 7,700 sq. ft. of offices.

The company will use the new facilities to manufacture plating and dipping tanks and related industrial equipment. To handle the welding operations involved, special high-voltage

electrical lines will be installed. One bay of the manufacturing and warehouse area will have 26 ft. ceilings to allow for the use of a 5-ton capacity overhead crane. In general, ceiling height will be 14 ft. Office ceilings will be of suspended acoustical tile and

these areas will be completely air conditioned.

Two recessed loading docks will be built for the receipt of parts and materials. Finished products will be loaded by the overhead crane onto flat bed trucks, and a loading area will be provided so that these trucks can drive into the plant. The site plan provides for off-street parking and the future use of available railroad siding.

**Gagnebin and Grubb
Appointed Assistant V.P.'s
of International Nickel**

The appointments of *Albert P. Gagnebin* and *L. E. Grubb* as assistant vice



**BUCKINGHAM
POLISHING and BUFFING
COMPOSITIONS**

- Stainless Steel Composition
- White Finish
- Tripoli
- Chrome Coloring Composition
- Greaseless Composition
- Emery Cake
- Brass Coloring
- Emery Paste
- Burring Compound
- Grease Stick
- Spray Pastes Stainless Steel Tripoli

Representation in Major Cities

Write Dep't. A for Samples

The BUCKINGHAM PRODUCTS Co.
14100 FULLERTON AVE. • DETROIT 27, MICH.

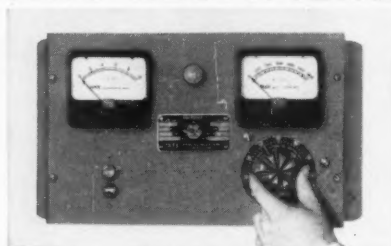
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NOW

BALANCED SINGLE KNOB STEPLESS CONTROLLED PLATING RECTIFIERS

**GERMANIUM
SELENIUM
SILICON
RECTIFIERS
WITH**



"Finger-Tip" Control Panel 10" x 18" x 6"

REACTRON MODIMATIC CONTROLS

- STABILIZED OUTPUT VOLTAGE
- SMALL OPERATOR'S PANEL MOUNTS ANYWHERE
- NO FLOOR SPACE
- SMALL INTERCONNECTING WIRES
- "FINGER-TIP" CONTROL
- NO MOVING PARTS
- LOW MAINTENANCE

*Controls all phases
simultaneously —
Avoids possibility of damaging
germanium junctions.*

The Ther REACTRON MODIMATIC CONTROL gives you instantaneous, perfect, stepless control of plating voltage. Stabilized output produces better plating. Single control knob controls all phases simultaneously...No possibility of damaging germanium junctions by improper setting of 22 or 44 position tap switches.

The miniature operator's control panel furnished with all MODIMATIC CONTROLLED rectifiers gives you "finger-tip" control where you want it. Can be mounted right at the plating tank — Requires no floor space — Measures only 10" x 18" x 6" — needs only #14 wires to control panel.

WRITE TODAY for technical study showing the advantages of Reactron VS. tap switch or motor driven variable auto-transformer controls.

It's THER... Whatever your D-C Requirement



THER ELECTRIC & MACHINE WORKS

ESTABLISHED 1915

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presidents of *The International Nickel Co., Inc.*, were announced recently.

Mr. Gagnebin continues as manager of the Nickel Sales Department, which is responsible for all of the company's sales and distribution of primary nickel products in the United States.

Mr. Grubb, who has been general superintendent of the Huntington, W. Va., Works since May, 1953, will be in charge of labor relations at all United States plants. He will transfer to the company's New York Office.

Claremont Changes Name

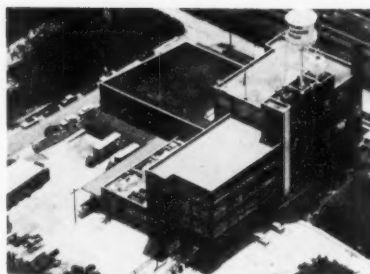
Claremont Waste Manufacturing Co., of Claremont, N. H., announces that it has changed its name to *Clare-*

mont Flock Corp. The firm has, through the years, devoted its operations exclusively to the conversion of natural and synthetic fibers into flock; thus the new name, which better defines the company's activities.

Personnel, policies, facilities and location remain unchanged.

New Manufacturing Facilities At Carolina Paint & Varnish Co.

New manufacturing facilities increasing production capabilities 40% have been completed at *Carolina Paint & Varnish Co.*, Greensboro, N. C. A total of 33,000 square feet has been added to the plant area bringing the total area under roof to 103,000 square



feet. A division of United Wallpaper, Inc., Chicago, the plant manufactures a variety of finishes for industrial and consumer applications in the South.

Universal Paint Expands Laboratory

Construction of a new \$33,000 development and testing laboratory, has just been announced by *Universal Paint & Varnish Inc.* When completed the addition will more than quadruple the current technical section.

Pennsalt To Sell White-Roth Metal Processing Machines

Pennsalt Chemicals Corp. of Philadelphia is now exclusive sales representative for the line of metal processing machinery made by the *White-Roth Machine Corp.* of Lorain, Ohio.

The move, unique in the industry, brings together a chemical firm with an established line of lubricants, coatings, phosphatizing compounds and metal cleaners and strippers, and a machine company that has stressed automation in its metal processing equipment, which includes washers, coaters and driers.

The coordinated effort is being headed by *John W. Mordica*, veteran of over 25 years in metal processing, including stints with two major steel companies before joining Pennsalt. Mr. Mordica's new title is manager of equipment sales for the firm's Metal Processing Department. His headquarters will be in Lorain, Ohio.

Acoustica Associates, Inc. Opens Plant

Acoustica Associates, Inc., 26 Windsor Ave., Mineola, N. Y., announces the opening of the company's fourth plant, located at 11601 West Jefferson Blvd., Culver City, Calif., in the Los Angeles area, which will provide more than 6,000 square feet of space for the production of ultrasonic instruments.

Brown Co. Appoints Downey

Andrew Brown Co. has appointed William Downey company representative for various sections of Tennessee, Kentucky, Indiana and Ohio. Veteran of World War II, father of two children, and ardent in sports and do-it-yourself hobbies, Bill has represented paint manufacturers for the past six years.

Armour Appoints Sales Supervisors

Peter W. Platten and Jack F. Breen have been appointed sales supervisors, Coated Abrasives Division, Armour & Co., Alliance, Ohio. The former will supervise both industrial and retail sales in the Eastern and Southern part of Michigan, and the latter in the West Cleveland area.

Prior to his recent appointment, Mr. Platten was a salesman with U. S. Borax and Chemical Co. He attended Michigan State University and Purdue University and the Shrine High School, Royal Oak, Michigan.

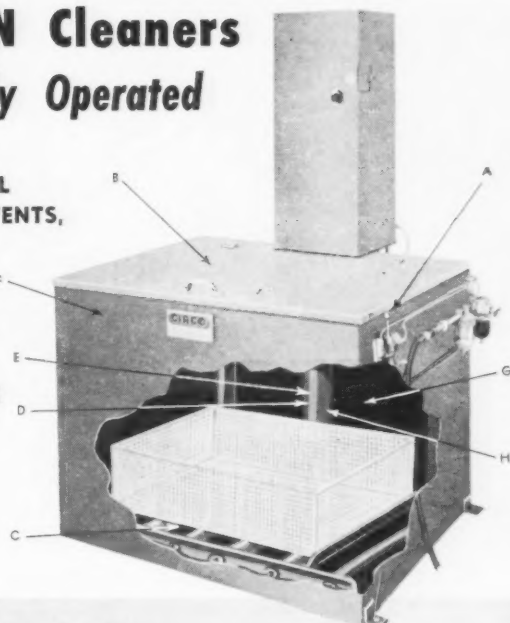
Mr. Breen was a salesman for the Osborn Mfg. Co. From February 1951 to February 1954, he served with the U. S. Marines as a sergeant in Korea and the Carribean areas. He attended Fenn College, Cleveland and the Lakewood High School, Lakeland, Ohio.

Diversey Expansion in Texas

Diversey Corporation of Chicago, manufacturer of chemical products and detergents for industrial use, has purchased a five-building insecticide plant in Waco, Texas, which will be the new office of the company's Southwest District. The new property includes two warehouses, an insecticide plant, employees' locker rooms and an air-conditioned office building, located on a 20-acre site a half-mile from the Waco city

AGITATION Cleaners Pneumatically Operated

FOR USE WITH ALL
CLEANERS — SOLVENTS,
EMULSIONS,
PHOSPHATIZING
AND ACID
SOLUTIONS FOR
HEAT TREATING,
QUENCHING, WAX
AND PROTECTIVE
COATING AND
OTHER LIQUID
PROCESSING.



- A. Only one control—three position valve.
1. raises rack. 2. lowers rack for soak.
3. agitates rack.
- B. Hinged steel cover. Fusible link causing
lid to drop in event of fire, optional.
- C. Supplied with grate platform.
Roller rack platform available.
- D. Length of up and down stroke variable
from 4" to 27"
- E. Number of strokes variable from
32 to 70 per minute.
- F. Tank shell is fabricated of solid heavy
gauge hot rolled steel.
- G. Available with immersion heating
choice of steam - gas or electric.
- H. The same air operated piston lowers,
raises and agitates the rack.

Since
1923



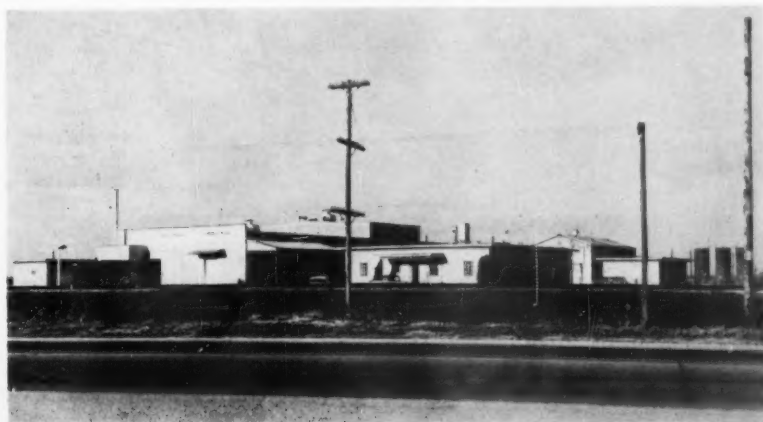
Write for New 4-page Brochure
with Complete Information on
All Models.

EQUIPMENT COMPANY

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Offices and Representatives in Principal Cities

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limits. The manufacturing room is 256 feet by 80 feet, with an 18-foot ceiling.

Three 12,000-gallon chemical storage tanks are located above ground in the rear of the plant. The new owners took possession January 2, and production is scheduled to begin February 1.

Gulton Industries Appoints General Manager For Ultrasonics

Appointment of Irwin I. Steinberg as general manager of the Vibro-Ceramics Division of Gulton Industries, Inc., was announced recently.

His appointment effective immediately, Steinberg relinquishes his duties as director of public relations and advertising, a position he has held since joining the company early in 1955.

Prior to his present employment,

COPPER SULFATE NICKEL SULFATE A COMPATIBLE ~TRIO~ PLATING INDUSTRY

There's reason for Triangle Brand Copper Sulfate and Nickel Sulfate being close friends with the plating industry. Over the years they have proved their **DEPENDABILITY**.

Why? It's obvious — purity, uniformity, solubility and high conductivity of their solutions result in *quality plating*.

All-important "extras" found in the use of Triangle Brand Copper Sulfate and Nickel Sulfate yield long-life plating performance that *makes the difference*.

Insist on Triangle Brand Copper Sulfate and Nickel Sulfate for dependable plating baths.

And remember, Phelps Dodge is also a basic producer of
SELENIUM TELLURIUM



PHELPS DODGE REFINING CORP.

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Irwin I. Steinberg

Steinberg was an electrical engineer with Western Electric Co. He is a graduate of the U.S. Military Academy at West Point and resides with his family in Fords, N. J.

Schwemer Now Distributor for Rhodes

Glen A. Schwemer of Wauwatosa, Wis., has become a distributor for the James H. Rhodes & Co. line of coated abrasives, steel wool, buffs and pumice; also other finishing equipment and supplies.

Prior to accepting the distributorship, Mr. Schwemer had his own plating shop for fifteen years, and had recently been associated with the Mc-



Glen A. Schwemer

Guire Co. He is a member of the American Electroplaters' Society and served as Milwaukee Branch president three years ago.

Universal Paint Names E. J. O'Brien

Edward J. O'Brien has been appointed technical representative for Universal Paint & Varnish Inc., Bedford, Ohio, manufacturers of industrial finishes. Closely identified with the paint industry since 1943, Mr. O'Brien's background covers both laboratory and development work, as well as technical sales experience.


Dr. B. D. Thomas Named Pres. of Battelle Memorial Institute

Dr. B. D. Thomas, scientist and research administrator, has been named to the presidency of Battelle Memorial Institute to succeed Dr. Clyde Williams, whose retirement as president was announced recently. Active head since being named director a year ago, Dr. Thomas has been a member of the organization for many years. He joined the staff as a research engineer in 1934, was appointed assistant director in 1942, and vice president in July 1955.

Dr. Thomas is a graduate of the University of Washington, where he was awarded a duPont fellowship in chemistry.

Edson Joins Kelite Corp.

Kenneth C. Edson has been appointed Los Angeles district sales manager by Kelite Corporation, manufacturer of industrial chemicals and steam cleaning equipment. He will be in charge of sales in one of two Los Angeles dis-



It will pay you to investigate

"Bright **LUSTRALITE® 10"**
the revolutionary

BRONZE PLATING DISCOVERY that speeds
and improves electroplating at lower
production cost ...

"Bright LUSTRALITE 10" has proved its superior qualities in day-to-day use on products like these and many others. It definitely makes finishing less expensive by eliminating buffing and minimizing the need for nickel. Yet it has excellent resistance to corrosion. The plate has exceptional leveling power, with a true bright finish.

"Bright LUSTRALITE 10" produces a brilliant, fine-grained hard bronze that's practical for both decoration and corrosion protection. Available through the same distributors that handle other Bat-telle processes listed on the opposite side of this page.

SEE OTHER SIDE FOR DISTRIBUTORS

... For more information about Battelle-developed processes, get in touch with any of these authorized Battelle Development Corporation distributors. Each is fully equipped to give you complete data and technical help.

**THE ENEQUIST
CHEMICAL COMPANY**
100 Varick Avenue
Brooklyn 37, New York

P. B. GAST AND SONS
1515 Madison Avenue, S. E.
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**THE GLOBE CHEMICAL
COMPANY**
Murray Road at Big Four R. R.
Cincinnati 17, Ohio
—also Dayton and Louisville

HYDRITE CHEMICAL COMPANY
605-621 South 12th Street
Milwaukee 4, Wisconsin

KOCOUR COMPANY
4802 South St. Louis Avenue
Chicago 32, Illinois

LASALCO, INCORPORATED
2818 LaSalle Street
St. Louis 4, Missouri

G. S. ROBINS AND COMPANY
126 Chouteau Avenue
St. Louis 2, Missouri

SCOBELL CHEMICAL COMPANY
Rockwood Place
Rochester, New York

Be sure to read about "Bright LUSTRALITE 10"[®]
on the opposite side of this page . . .

other Battelle Processes that simplify plating, add beauty and improve products

Electropolishing

A wide range of finishes is available. Gives products new sales values. Extraordinary smoothing action produces a micro-polished effect. "True metal color" is achieved with a lustre not attainable with belts or wheels. Metal surfaces remain undamaged.

Electrodeburning—A variation of electropolishing, excellent for smoothing sharp, burred metal for safe handling and precision functioning. Indispensable for parts having burrs in hard-to-reach places. For many items, electrodeburning plus electroplating produces the best possible and most economical finish.

Chemical Polishing

Smooths as it brightens. Won't etch. Brings out basic lustre. Especially suitable for small parts and those of intricate design. Can be plated over. Easy to install and operate . . . requires only a tank and heating element.

STANDARD[®] Bright Nickel

Produces mirror-like surfaces. Has excellent leveling action, ductility, and corrosion resistance. Very hard (Knoop 500-580) and wear resistant. On 18-gauge steel, can be bent around a 1/2-inch radius without cracking.

Tin Immersion

Coats copper and a variety of brasses and bronzes against "green water." Coats wires against corrosion. Easily controlled cold bath.

LUSTRALITE[®] Electroplating Processes also include LUSTRALITE 20, a rich golden plate; LUSTRALITE 10, a deep bronze red; and LUSTRALITE 45, silver white, of sterling appearance. Data upon request.

Please let me have more information. I am particularly interested in the following Battelle processes:

YOUR NAME _____
TITLE _____
FIRM NAME _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____

want more data?

**mail coupon
to distributor
nearest you**



Kenneth C. Edson

tricts of the western sales region. His headquarters will be at the Los Angeles plant.

Mr. Edson's background includes experience in the petroleum and petrochemical industries. He has had 15 years of research, process engineering, customer service, and sales experience with Skelly Oil Co. and the Du Pont Co. A chemistry graduate of the University of Nevada, he has done graduate work at Texas A. & M.

Ampco Appoints Distributors

The Pump Department of *Ampco Metal, Inc.* has named as distributors of its centrifugal pumps Stanley Berg, Inc., 1231 Banksville Road, Pittsburgh 16, Pa., Grace Engineering Sales, Inc., 1110 West Wisconsin Ave., P.O. Box 145, Appleton, Wisc., and Ohio Pump Co., 764 South Broadway, Salem, Ohio.

Effective immediately, the new distributors will supply the complete line of corrosion-resistant pumps of both metallic and elastomer-metallic construction, as well as spare parts for these pumps.

New Appointments Announced At Beckman

Beckman/Scientific Instruments Division, Fullerton, Calif., announces the recent appointment of *Charles D. Kennedy* as new product specialist for pH-electrochemical instruments, to assist customers in sales and service and provide necessary technical assistance. Kennedy did laboratory work for the I. H. Flour Mills in Topeka prior to joining the company. He holds a BS degree from Kansas State College.

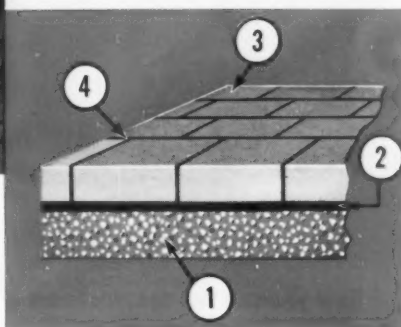


... and will cost practically nothing for maintenance

- 1 It is built on a rigid, solid sub-base—4" to 6" thick.
- 2 The sub-base is protected by a thick corrosion-resistant "Resilon" membrane.
- 3 Over the membrane, a course of dense, tough, spall-resistant "USSCO" acid brick.
- 4 Bonded by wafer-thin, non-porous joints with "Durisite" acid-and-alkali resistant cement.

Yes, here's a corrosion-resistant floor that will outlast the building itself. Expensive? Savings in maintenance, alone, will make it over the years the lowest cost floor you can install.

Here's why this
ACID PROOF FLOOR
will last for
FIFTY YEARS
or more!



Write for this free booklet!

Detailed construction drawings showing approved methods of building floors, trenches, gutters, tank and motor supports, etc., with full technical data, photographs and case histories. Ask for Bulletin AB-17.



PROCESS EQUIPMENT DIVISION


U. S. STONWARE
AKRON 9, OHIO

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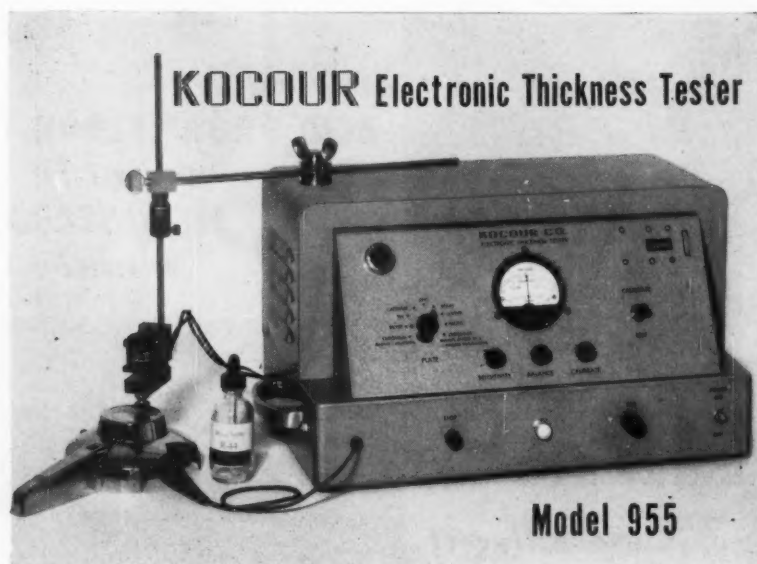
Ahrens Named Sales Manager of Paasche Airbrush

The appointment of *Donald Ahrens* as sales manager of *Paasche Airbrush Co.*, a division of *Cline Electric Mfg. Co.*, Chicago, was announced recently. Mr. Ahrens started with the parent organization, in April of 1951 as administrative assistant in the War Products Division. While there, he went through a rigorous sales training program which included field service training. He came to Paasche as a field service trouble shooter in 1955 and soon became manager of the Chicago sales force.

Mr. Ahrens attended Michigan State College and is a graduate of Roosevelt



Donald Ahrens



Now you can test the thickness of COPPER over ZINC DIE CAST

We are proud to announce the addition of an important new test to the applications of the Kocour Electronic Thickness Tester. You can test copper over zinc die-cast with all the advantages of the instrument, including direct readings in hundred-thousandths of an inch.

MODEL 955 virtually eliminates human error

The human elements affecting accuracy have been virtually eliminated with simple automatic operation . . . direct readings . . . reproducible results . . . calibration adjustment and thickness standards to verify satisfactory operation. At every point the Kocour Electronic Thickness Tester proves itself to be a reliably dependable method providing accurate results . . . truly a basis on which both buyer and seller of plating can rely. Get the details today!

Ask for a demonstration or 15 day Free Trial!

KOCOUR CO.

Pioneers in Control for the Plating Industry

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CHICAGO 32, ILLINOIS

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University, School of Commerce. He served in Japan as a member of the Army Occupational Forces.

International Nickel Promotions

Ralph D. Parker, vice-president in charge of Canadian operations of *The International Nickel Co. of Canada, Ltd.*, will move his headquarters from Copper Cliff, Ontario, to the company's offices in Toronto early in the new year. The Toronto offices have recently moved to larger quarters at 55 Yonge St. Mr. Parker will continue to direct Inco's Canadian operations from these offices.

Ralph H. Waddington, James C. Parlee, Richard A. Cabell and Paul Que-

neau have been elected assistant vice-presidents effective January 1, 1958.

Mr. Waddington has also been appointed general manager of the parent company's Ontario Division and Mr. Parlee general manager of its Manitoba Division. Messrs. Cabell and Queneau have been elected also as vice-presidents of *The International Nickel Co., Inc.*, the United States subsidiary of the company.

Engelhard Industries, Inc. Formed

Formation of a new corporation with annual sales in excess of \$200-million, the world's largest fabricator of precious metals and one of the 200



Flanked by Charles W. Engelhard (left), board chairman, and Gordon W. Richdale, president, Ben Grauer presides at a show at New York's Waldorf-Astoria recently marking the formation of Engelhard Industries, Inc., the largest fabricator of precious metals in the world.

largest industrial companies in the United States, was announced last month. Named *Engelhard Industries, Inc.*, it was formed by a consolidation of nine American companies in the precious metals and precision-manufacturing fields, some of them over 50 years old. *Charles W. Engelhard*, best known heretofore as a spokesman for the worldwide platinum industry, is chairman of the board of the new company. The president is *Gordon V. Richdale*, a financial associate of Engelhard, a former official of the Bank of England and a former South African gold-mining executive.

The consolidation was announced at a banquet at the Waldorf-Astoria, described by a company spokesman as the largest and most elaborate affair of its kind ever held in New York by a company which does not make consumer products. Including an hour-long live show on the company's activities and a 5300-sq.-ft. industrial exhibition of its products, it was estimated to have cost \$50,000. Bars of precious metal, jewelry, and precision equipment in the exhibition were valued at \$890,000.

Largest of the firms consolidated is *Baker & Co., Inc.* Another is the 50-year-old *Hanovia Chemical & Mfg. Co.*, producers of liquid precious metals for the ceramics industry and of gas-discharge lamps. The other consolidated companies are: *The American Platinum Works*, refiners and workers of silver; *Amersil Co.*, manufacturers of fused quartz; *East Newark*

Industrial Center, Inc., managers of some 1-million sq. ft. of industrial property; Irvington Smelting & Refining Works; D. E. Makepeace Co., producers of atomic-reactor components and precious-metal materials; National Electric Instrument Co., manufacturers of industrial and medical instruments; and The H. A. Wilson Co., producers of thermostatic materials, electrical contacts, laminated metals, and special alloys.

**Wagner Bros., Inc.,
Promotes N. D. Murray**

N. D. Murray, for the past several years a key order expeditor at Wagner Brothers Inc., Detroit, has been appointed administrative assistant to F. M. Mansfield, vice president in charge of sales.

Murray's new duties will include coordinating distributor and advertising activities for the concern's two Detroit plants and its West coast subsidiary, Automatic Molding Machine Co.

**Binks Mfg. Co. Holds First
Annual Service Award Dinner**

More than 300 employees of the Binks Mfg. Co., Chicago, attended the company's first Annual Service Award Dinner held recently at a Chicago hotel. All employees having five or more years of service with the company were invited to the dinner. Employees received gold medallions inscribed with their names. Of these employees, 29 wore special boutonnieres signifying 25 or more years of service.

Highlight of the evening was a special medallion presentation ceremony in honor of the company's three most senior employees, Chester R.

DAVIS-K . . . LEADER in electrolytic Precious Metals!



**First! WITH
ONE OPERATION
Antique
Gold Solution**

An inexpensive, quality electroplate with excellent color consistency and remarkable ease of operation.

**First Again!
with ONE OPERATION
Antique Silver Solution**

A Rich French Gray Antique Finish That Improves Quality and Costs Less!

Now the luxurious Antique French gray finish can be achieved quickly and easily with the new Davis-K one operation antique silver solution. Like all products engineered by Davis-K, this solution is tested and proved to be uniform in performance, outstanding in economy and unsurpassed in results.

OTHER DAVIS-K PRODUCTS:

- **HARD GOLD SOLUTION** for Printed Circuits and Electronic Parts
- **POTASSIUM GOLD CYANIDE SALTS**
- **LUSTROUS WHITE RHODIUM SOLUTION**
- Variable-type Tank Rheostats, specially designed for precious metal plating.

ALL DAVIS-K GOLD PLATING SOLUTIONS ARE:

- Made in all colors
- Color constant
- Tarnish-resistant
- Brilliant in finish
- Bottled by Troy Weight
- Made from assayed US Treasury Gold only
- Ready for immediate use

We are fully equipped to reclaim old gold and rhodium solutions. No charge for small sample plating. Write Dept. MF-2 for details!

**FREE
Consultative Service**
Call on Davis-K process engineers for help with your special plating problems and installations.



"Where Glittering Elegance Reflects Lasting Quality."

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Burke B. Roche, (right) president of the Binks Manufacturing Company, Chicago, presents a diamond-jeweled gold service medallion to Chester R. Kranz, Manager of Binks Manufacturing Company Water Cooling Division and employee with the longest service record. Occasion was the company's first Annual Employee Service Award Dinner held at a Chicago hotel recently. Kranz has been with Binks 45 years. Looking on (left to right) are the next two senior employees, Carl J. Braun, 34 years service, and William F. Stasch with 40 years. These three men represent 119 years of experience in the manufacturing of paint spraying equipment.

Kranz, 45 year employee, William F. Stasch, 40 years, and Carl J. Braun with 34 years service. Burke B. Roche, president of the 64-year-old spray painting and water cooling tower equipment manufacturing company, made the presentations.

Logo, Inc. Retains Schimmel

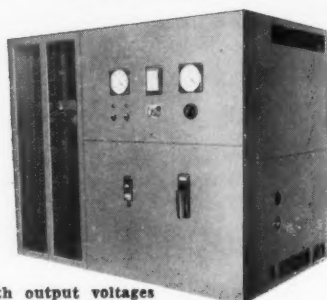
Milton T. Schimmel has been retained as a finishing consultant to represent Logo Inc. Division, Bee Chemical Co.

From 1956 until recently, Mr. Schimmel was general manager of Mirra-Cote Co., Inc., El Segundo, Calif., engaged in vacuum metalizing of both plastics and metals. Prior to moving to

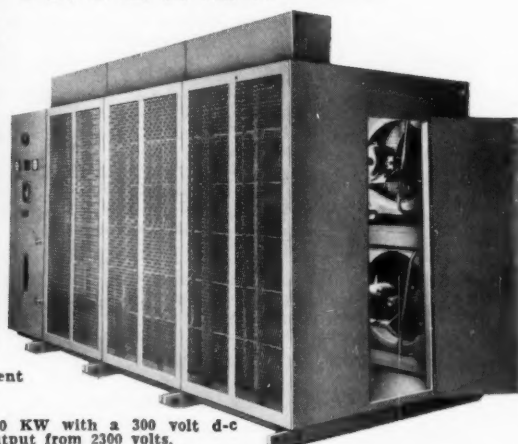
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Milton T. Schimmel

California, he was general manager of Conforming Matrix Corp. of Toledo, Ohio. Earlier, he was superintendent and chief engineer of Manufacturers Enameling Corp. of Toledo for four years.

Mr. Schimmel studied both mechanical and electrical engineering at the Universities of Cincinnati and Toledo. He is a member of the Society of Plastics Engineers and American Society of Tool Engineers.

Mr. Schimmel is now located at 14017 South Wilkie Ave., Gardena, Calif., from which location he will service west coast accounts.

Sandoz, Inc. Acquires Fine Colors Co.

Sandoz, Inc., has acquired the stock of Fine Colors Co., of Paterson, N. J., manufacturers of pigment colors, effective December 20th. Fine Colors will



Dr. John W. Ackerman



Max Gossweiler

continue to operate unchanged as a division of Sandoz, and extended research and testing facilities are planned for further improvement of pigments.

All personnel will be retained. Production will continue under the direct supervision of *Dr. John W. Ackerman* who has been president of the company for the past 16 years and sales and service under the direction of *Max Gossweiler*, manager of the division.

Officers Elected At DuBois Co.

Charles A. DuBois and *Louis Lerner* were elected president and executive vice-president respectively, at a meeting of the board of directors of the *DuBois Co., Inc.*, following the death of the company's founder, *T. V. DuBois*.

At the same directors meeting, other officers elected were: *Ateo Gulino*, *C. C. Hargadine*, *Samuel J. Miller*, and *A. Howard Mount*, divisional vice-presidents; *Paul F. Goebel*, secretary-treas-



Charles DuBois

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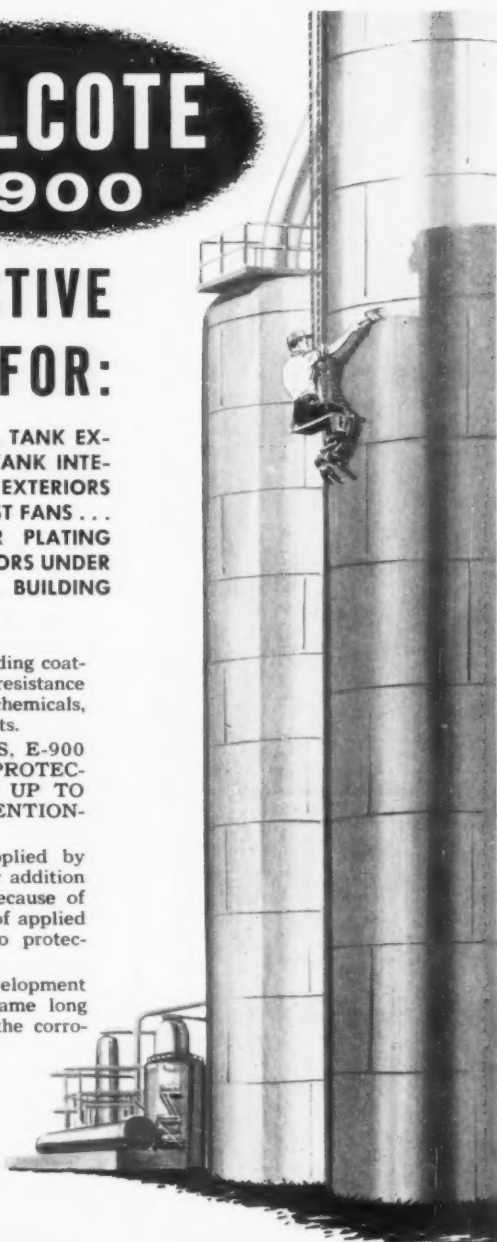
STRUCTURAL STEEL . . . TANK EXTERIORS . . . WATER TANK INTERIORS . . . TANK TRUCK EXTERIORS . . . STACKS . . . EXHAUST FANS . . . CONCRETE PIERS FOR PLATING FOUNDATIONS . . . FLOORS UNDER STORAGE TANKS . . . BUILDING WALLS . . . PIT WALLS.

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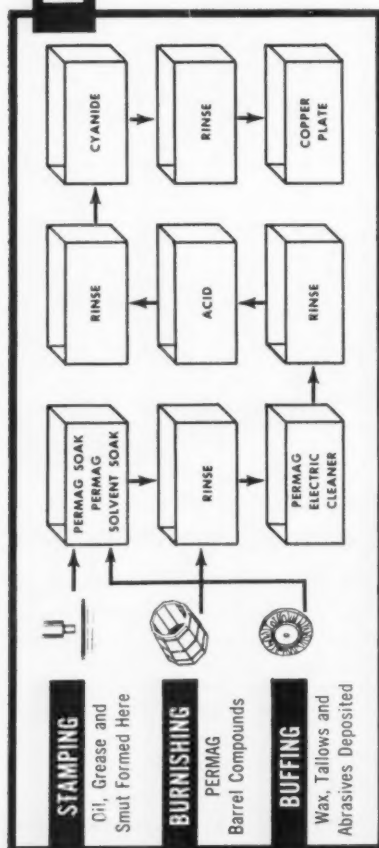
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Louis Lerner

urer; and George H. Scheper, asst. secretary and asst. treasurer.

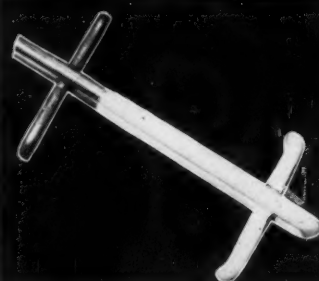
Oakite Adds Two Divisions to Field Organization

Oakite Products, Inc., pioneer manufacturers of industrial cleaning and treating materials, now entering their fiftieth year of service to industry, have announced the establishment of two new divisions in their nationwide field organization.

Rochester will be the headquarters of the new Upper New York State Division, which will comprise the technical field representatives and warehousing facilities now based in Albany, Utica, Syracuse, Binghamton, Elmira, Rochester, Buffalo, and Scranton, Pennsylvania. *Walter G. Sittmann*, formerly Pittsburgh division manager, has been transferred to head the new division. Mr. Sittmann, a veteran of twenty-one years service with the com-



Walter G. Sittmann



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COLOR	Unlimited
WEIGHT	Sp. gr. = 1.20 or 10 lb. per gal.
TOXICITY	Can be formulated to be non-toxic
AGING PROPERTIES	Good
LIGHT RESISTANCE	Good
TYPE OF SURFACE	Dry and glossy
TENSILE STRENGTH	Very Good
SCUFF RESISTANCE	Very Good
ABRASION RESISTANCE	Very Good
ALKALI RESISTANCE	Very Good
ACID RESISTANCE	Very Good
OIL RESISTANCE	Very Good
HARDNESS	As high as 80 (Shore-A)
% FILM FORMING	100%
VISCOSITY	3,000 to 4,000 cps.
COST PER 0.001" THICKNESS	App. \$.37 sq. yd.
FIRE HAZARD	None

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- #51: Similar to #50, but bluish chrome-like color.
- #52: Low-cost, no leach, bright, passive.

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- #50: See under Zinc, above.
- #53: Improved solubility, control, safety in handling; requires leach.

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John P. Melhado

pany, was for seven years field representative in northern Indiana before his appointment as Pittsburgh division head in 1953. He has established his office at Room 226, Fitch Building, 315 Alexander St., Rochester 4, N. Y.

John P. Melhado, formerly a field representative in New York City, will replace Mr. Sittmann in Pittsburgh. Mr. Melhado joined the firm in 1949 after many years as a superintendent in metal finishing shops.

The new Mid South Division will consist of representatives in Cincinnati, Nashville, Little Rock, Knoxville, Louisville, Evansville, Jackson, Shreveport, Memphis, and New Orleans. Victor L. Baltzell, representative in Dallas for the past fifteen years, has been appointed manager of the new division. He will make his headquarters at Room 839, Commonwealth Building, 4th and Broadway, Louisville 2, Ky.



Victor L. Baltzell

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PATENTS

(Continued from page 85)

Tin-Copper-Cadmium Bath

*U. S. Patent 2,802,780. Aug. 13, 1957.
R. E. Shockley, assignor to Platalloy Corp.*

The method of securing a dense, mirror-bright finish by electroplating metal articles with an intimately bonded alloy deposit of tin, copper and cadmium, which comprises immersing the article as a cathode in an aqueous solution of from 10.2 to 12.0 ounces of potassium stannate, 1.8 to 2.4 ounces of cuprous cyanide, 0.06 to 0.75 ounce of cadmium oxide, 5.5 to 7.5 ounces of sodium cyanide, 2.7 to 3.0 ounces of sodium hydroxide, and 2.0 to 5.0 ounces of boric acid, each per gallon of water, immersing in the bath as an anode an alloy of tin, copper and cadmium in the same proportions as those like metals of the salts of said bath; and maintaining the temperature of said bath between 120 and 140°F.

Buffing Wheel

*U. S. Patent 2,803,096. Aug. 20, 1957.
S. C. Mockiewicz, assignor to American Buff Co.*

In a buffing wheel having a plurality of radially extending buffing fingers, the improvement which comprises constructing each finger of an elongate strip of coarsely woven sisal fabric, said strip being cut on the bias and longitudinally folded to form a core, a tightly woven soft fabric cover, said cover being cut on the bias and transversely enfolded around the sisal core, said enfolded core and cover being longitudinally folded along a central bight portion in such a manner that all longitudinal edges of both the soft fabric and sisal fabric are internally disposed, said finger being longitudinally stitched to maintain said sisal core and said soft cover in juxtaposed integral relationship.

Combination Sisal and Cotton Buff

*U. S. Patent 2,803,097. Aug. 20, 1957.
S. C. Mockiewicz, assignor to American Buff Co.*

A buffing wheel comprising a central hub, a laminated sheet having convolutions arranged in the configuration of an undulatory spiral about said central hub, said sheet comprising at least one hard coarsely woven lamina-

tion and at least one soft tightly woven lamination in overlying relationship and joined together at a plurality of spaced positions over substantially all of said sheet.

Electropolishing Magnetic Articles

*U. S. Patent 2,803,595. Aug. 20, 1957.
S. Anzaldi, assignor to Raytheon Mfg. Co.*

A method of electropolishing articles having magnetic properties including the steps of magnetically securing an arcuate disc to one pole only of a magnet, magnetically attracting a plurality of said articles into contact with spaced portions of the periphery of said disc, immersing said disc substantially vertically in an electrolytic liquid medium, and passing a current through said disc and said articles.

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

Convention Functions

Committee chairmen of the Cincinnati Host Branch for the 45th Annual Convention of the American Electroplaters' Society are working like rocket scientists to iron out details on what is shaping up to be the best educational and social program ever offered by the A.E.S.

Chairman and Co-Chairman Charles Wise and Ezra A. Blount already have a tentative program for the gathering, which is to be held May 18-22, 1958.

Registration; Get-Together Party

Platers and their wives will begin registering for the convention on Sunday, May 18. Stewart Chipman, entertainment chairman, has announced that, to get things rolling, the Annual Get-Together Party will fracture the ice for the convention on Sunday evening, May 18, 1958. Music, dancing and refreshments will add to the gaiety of renewing old acquaintances.

Opening Session

Chairman Charles Wise will bang the gavel for the official opening of



Hotel Sheraton-Gibson
Headquarters

this convention on Monday morning, May 19.

Educational Program

Educational Chairman Robert Miller's four speakers will present four of 25 or more papers to be given throughout the convention on Monday afternoon. The men who present these technical papers devote many hours to preparing talks that will be interesting and timely, spotlighting the latest research and development efforts in finishing and allied fields.

The lecturers now in the process of preparing papers for this convention are experts in their fields, well qualified to answer technical problems and discuss new developments. Educational sessions will be held every day throughout the week.

M.F.S.A. Open House

Monday's social highlight will be the Open House sponsored by the Metal Finishing Suppliers' Association. All conventioners are invited to this party, which is held in the evening, complete with music, dancing and refreshments.

Golf Party and Outing

Tuesday is scheduled to be a busy day. Morning educational sessions will be followed by the M.F.S.A. Golf Tournament for the divot diggers at Kenwood Country Club and an outing for the whole family at Coney Island Amusement Park, planned by Arthur Gerada, outing chairman. Coney is one of the nation's largest and cleanest amusement parks. Located on the Ohio River, a short distance from Cincinnati, it includes the world's largest re-

circulating swimming pool, which will be open to aquatic-minded platers and their families; rides of all kinds, from screaming roller coasters to the newest rocket ships; miniature golf; and clean, pleasant picnic areas. A buffet luncheon will be served at about 1:00 P.M.

More Education; Floor Show and Dance

Wednesday will be the big day for technical sessions. Dual educational programs are scheduled for both the morning and afternoon. But platers will be allowed to toss away their technical troubles (temporarily, at least) in the evening while watching a top-flight floor show and then dancing in the hotel ballroom.

Business Meeting; Annual Banquet

On Thursday, the delegates will vote on the new A.E.S. officers and transact other business at the annual meeting of the Society; the final technical papers will be presented; and the *Annual Banquet and Dance* will be held, after which the weary plater will pack

up his clothing, his wife, and the information he has gained and head back for the land of tanks and racks to practice what he has learned during a busy but profitable convention.

For the Ladies

Wives who attend the convention will be as busy as hubby during this spring-time week. Mrs. Robert Miller and Mrs. William Young, who are in charge of the Ladies Program, have arranged a program tailored for the ladies, with something happening every day.

Besides attending the banquets, parties and luncheons, the ladies will want to tour Cincinnati's many cultural attractions and take a sight-seeing tour to see some of the breathtaking hill-top views of the City of Seven Hills.

During the first day of the convention, while the men are attending to business, the ladies will be entertained at the *Aunt Ella Luncheon*, sponsored by Oakite Products, Inc., to be held on Monday in one of Cincinnati's newest and finest eating places, the *Colony Restaurant* in *Swifton Shopping Cen-*

ter. Immediately following the luncheon, the ladies will attend a style show at nearby *Rollman's*.

On Tuesday, the ladies are urged to play golf in the morning at *Kenwood Country Club* and to attend the outing in the afternoon at *Coney Island*.

Noon-time Wednesday will find the ladies at a luncheon sponsored by *Products Finishing* magazine in the *Roof Garden* of the *Sheraton-Gibson*; an audience-participation program will be featured at this luncheon.

The ladies will climax their part of the program with the annual *Plato Party*, sponsored by the *Udylite Corporation*, at noon on Thursday in the *Pavilion Caprice* of the *Netherland-Hilton Hotel*. And of course they'll go to the banquet on Thursday evening to celebrate the end of a successful convention.

Plant Visitations

Ray Barry, chairman of the *Plant-Visitation Committee*, has arranged three educational plant tours during convention week (May 19-22).

The first of these tours will take interested platers through the plant of



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the world's largest machine tool manufacturer: *Cincinnati Milling Machine Co.* This tour will take place on Monday afternoon, May 19, at 2 P.M. This modern plant in Cincinnati manufactures milling machines, broaching machines, cutter and tool grinders, special machine tools, metal-forming machines, hardening machines, cutting fluid and grinding wheels. Metal cutting, metal forming, foundry and heat-treating, as well as finishing operations will be seen on this tour.

The second tour will find the conventioners getting an education in steel making as they go through *Armco Steel Corporation's* plant in Middletown, Ohio. This in indeed a worthwhile experience, showing steel making from the dramatic view of a furnace and the shower of sparks in tapping, through the rolling operations where the long red-hot slabs travel at express train speeds, getting thinner and thinner as they go, and finally rolling up into a coil in one continuous operation; then through the shearing, trimming and heat-treating operations; and finally through *Armco's* modern facilities for applying their

patented hot-dip galvanized coating "Zincgrip."

The third tour will take the platers through the largest plating installation in the Cincinnati area, the *Electric Auto-Lite Company's* bumper plant. Those who take in this tour will be rewarded by seeing a plant that has rapidly expanded in recent years, becoming more and more automatic with each expansion. This plant is an excellent example of a large top-flight plating installation, making use of the most modern equipment and techniques to produce quality bumpers in quantity.

The Auto-Lite Sharonville plant includes everything needed in equipment and techniques to produce the modern shapes showing up on today's bumpers: from automatic sheet polishing machinery, through huge forming presses, the latest fully automatic plating machines, and a modern waste treatment plant to purify material from the plant's many tanks.

Was you efer in Zinzinnati? Make sure you are during the week of May 18-22.

Lancaster Branch

The regular meeting of the Lancaster Branch was held on December 13th with thirty-four members present. The program included a dinner in the Schick cafeteria and a short business meeting at which time six new members were elected to membership giving the branch a total of seventy-three active members. The new members are *S. Reed Keator, Paul Zimmerman, Charles Cline, Lloyd Feese, James Johnson, and Meade Wilt.*

Curvin Miller, branch president, spoke briefly concerning the moving of *Ray Vines*, one of the active members, to another state. During Ray's membership in the branch he took a very active part in branch activities. At the time of his moving Ray was serving on the board of managers.

The meeting concluded with a plant visitation through the new Schick Inc. plant in Lancaster, Pa.

Twin City Branch

The Twin City Branch held its regular monthly business and technical meeting at Jax Cafe in Minneapolis,

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Minn., on December 2nd. Forty-two per cent of the membership and eight guests were present.

Branch President *Warren Johnson* introduced National Third Vice-President *D. Andrew Wesley*, who spoke briefly to the members. The main theme of his address was the relationship between the branches and the national society.

The technical speaker for the evening was *Dr. Edward Saubestre* of Sylvania Electric Products, Inc., who delivered an extremely interesting and informative lecture on "Plated Wiring." A short question and answer period followed.

John M. Zangs, Jr.
Librarian

British Columbia Branch

The final meeting of the year consisted of a tour of the facilities of the B. C. Research Council located on the University of British Columbia campus.

Messrs. Crawford, Cave and Wright of the council conducted three separate groups of society members and their wives through all the departments in

their building—including Terredo control, metal analysis, chromatography, spectrum analyses, library, metal fatigue, tantalum oxide coating, and X-ray.

Following the tour the members journeyed to the nearby Dolphins Restaurant where a short meeting followed by light refreshments completed a very interesting evening which was both informative as well as entertaining.

J. Lee
Secretary

Southeastern Branch

The Southeastern Branch held its regular meeting on December 13 at the Belmont Steak House in Atlanta. 35 were in attendance with *Charles I. Lewis* presiding. New members announced were: *Richard J. Green* of the Atlanta office, International Nickel Co. and *Charles L. Eberlein* of Herschell Corp. in Griffin, Ga.

It was Charter Member's night, so charter members in attendance rendered short talks about the history of the branch. These charter members

were: *M. E. Awtrey*, *Clyde Stovall*, *William T. Weymouth*, and *H. R. Stogner, Sr.* *George W. Taylor* reported on the activity of the first meeting of the new National Membership committee held in Detroit on December 7, 1957.

The 3rd Annual Technical Session, with participation from Blue Ridge Branch and Miami Branch, scheduled for February 14 and 15, 1958, will be the biggest regional plating meeting ever to hit the South. Speakers for the occasion will be *Vandenburg* of Alcoa, *Saltonstall* of Udylyte, *Sample* of International Nickel, *Mahlstedt* of Metal & Thermit, and *Pike* of H-VW-M Co. A plant tour of the main plant of Scripto is arranged.

The speaker for the evening was *R. J. Hafer*, chief finishing engineer, Reynolds Metals Co., who spoke on anodizing aluminum.

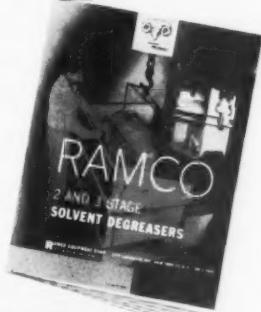
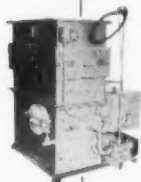
Robert H. Probert
Secretary & Treasurer

Chicago Branch

The December meeting of the Chicago Branch was held on the 13th at

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Silver-Brite is simple to use and will increase your silver plating efficiency. Many companies have used it for plating as high as .040" silver on bearings. Others have used it for thin bright commercial deposits.



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Stauffer's restaurant at 26 West Madison St. The dinner was held at 7:00 p.m. and the educational program started at 8:30 p.m. The meeting was well attended by the members. A short film was shown, preceding the technical program describing the building of the DEW Line near the Arctic Circle. The film was the property of Western Electric who were prime contractors for the installation of the radar line.

The speaker of the evening was *Christopher Marzano*, Branch publicity chairman, and director of the chemical laboratories at Amphenol Electronics Corp. The subject was "How to Plate Difficult Metals." Mr. Marzano used slides, showing the steps involved for preparing each of the metals for plating. The information was greatly appreciated by the members present. In answer to the many requests for copies of this paper Mr. Marzano has agreed to prepare this paper for publication.

After a very lively and interesting question and answer period the meeting was dismissed with a rising vote of thanks.

J. C. Corre
Librarian

Newark Branch

A meeting of the Newark Branch was held on Friday, December 13th with President *Grigat* presiding. Seventy were in attendance—including visitors *Herb Head*, National first vice president, *George Swift*, National past-president, and Messrs., *Kane* of Montreal, *Lee* of Waterbury and *Benner* of New York.

Five applications were accepted and *Joseph Palaszewski* of Wright Aeronautical, *Albert Winter* of Whitehead and Hoag, and *Frank Dalton* of Radio Corporation of America were elected members. *Joseph Muscarella* was transferred to Louisville and *Rene Sonnenfeld* to Syracuse, while *Ernest Collins* was welcomed to Newark from Waterbury. Ed is now with U. S. Metal Coatings Co.

Librarian *Fred Meyer* then introduced *Hy Koretzky* of Hanson-Van Winkle-Munning Co. whose timely topic was Waste Disposal Problems. He reviewed quickly the waste disposal situation and then described an unexpected complication that caused difficulties in one instance.

Robert Goodman of E. I. duPont de

Nemours and a member of Newark Branch then discussed Effects of Impurities in Cyanide Plating Solutions. Particular reference was made to cyanide zinc and copper solutions. The contaminants most apt to cause trouble were discussed with respect to results and removal.

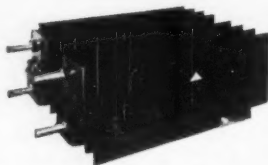
The meeting adjourned with less tarrying than usual — the members hurrying home for a good rest prior to the Christmas Party held the next evening.

The Christmas Party got under way in a fine manner with MFSA members *Ethnone, Inc.*, *Frederick Gumm Chemical Company*, *Hanson-Van Winkle-Munning Co.* and *Udylite Corporation* sponsoring a joint cocktail party, which proved to be enthusiastically received. Promptly at 8:00 p.m., the 325 in attendance moved into the Ballroom of the Robert Treat to enjoy a grand roast beef dinner. The entertainment with *Jerry Tolman* as Master of Ceremonies, *Nelson* and *Elliott*, songsters, and *Bob Howard*, pianist and singer, put everyone in a real holiday mood, so much so that the dance floor remained crowded until closing at 2:00

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a.m. The Banquet Committee, particularly Chairman *Gus Bittrich*, and Entertainment Chairman *Louis Donroe*, did a fine job much appreciated by the Branch.

D. Gardner Foulke
Secretary

Los Angeles Branch

Los Angeles Branch devoted its final meeting of 1957, at Rodger Young Cafe on the night of December 11, to a good fellowship and entertainment program combined with a testimonial to one of the plating industry's most distinguished members.

The program was announced by Secretary *Emmett H. Babcock* as "Don Bedwell Appreciation Night," during which Mr. Bedwell, dean of Southern California's plating industry, was testimonialized for his contributions to the industry over a period of more than 45 years. The occasion was inspired by the fact that Don recently retired as general foreman and plating supervisor of the Hall-Mak Co. of Los Angeles.

Earl Coffin, one of Don's old plating

cronies in the period 1920 to 1950 and, in recent years, a L'Hommedieu sales engineer, served as master of ceremonies and tossed some well phrased verbal bouquets and compliments at Don. A number of other old-timers, and others not-quite-so-old, took the microphone to add other chapters of the Bedwell saga. All this made Don feel so good that he decided to make a speech himself.

Don largely confined his comment to a narration of experiences and happenings which came his way during the trip he and Mrs. Bedwell took to the South Sea Islands and Australia in July, 1957. His comments were pithy, pertinent, educational (as to the plating remarks) and, in some instances, hilarious. His particular praise was devoted to Australia and its peoples, whom he characterized as, the most hospitable and friendly in the world, who bend over backward to make the visits of folks from the United States interesting and entertaining. He also discussed some of the Australian plating plants he had had occasion to inspect in Sydney and its environs. (His comments on Australian plating plant

visitations were described in some detail in the September, 1957, issue of METAL FINISHING.

Branch President *George Magurean* held business matters to a minimum at this meeting. Guests were introduced by Sergeant-At-Arms *Milton Weiner*, including: *Gilbert Bishop* of Coronado Mfg. Co., Long Beach; *Harold Zoyan*, Bumper & Auto Processing Co., Los Angeles; and *W. A. O'Mara*, Western Intaglio Co., Los Angeles.

Mr. Weiner, incidentally, has introduced an effective way of preserving a permanent record of visitors at branch meetings. He has supplied a hard-cover ledger book in which one-page a month is devoted to visitors attending the meeting. As the years pass, Milton feels, the branch will have available an impressive list of visitors, their names, and company affiliations.

The date of the Branch's 1958 educational session was announced as March 22, with the Los Angeles Ambassador Hotel as the site. The branch's officers and directors were to meet with the special Educational Session Committee early in January to map preliminary plans for the affair.

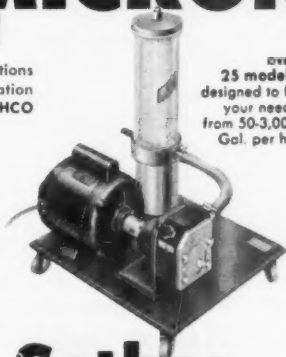
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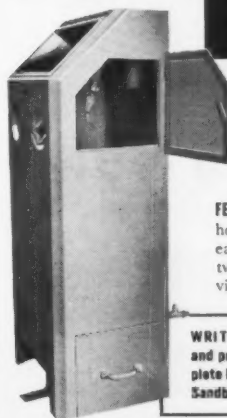
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Dayton Branch

The Dayton Branch will hold its Twelfth Annual Educational Session and Dinner Dance, March 1st, 1958 at the Hotel Biltmore, Dayton, Ohio.

The Educational Session will get under way at 1:30 P.M. and will include the following subjects:

"Ultrasonic Cleaning" by *Dr. Frank W. Hightower*, Branson Ultrasonic Corp., Stamford, Conn.

"The Anode's Side of the Story" by *John B. Winters*, Incar, Inc., Cleveland Ohio and a third topic yet to be announced.

The dinner and dance will get under way at 6:30 P.M.

Tickets are on sale now at \$6.50 per person and may be obtained from Ticket Chairman, *Byron Bowman*, Aeroproducts-Allison Div., GMC, Van-dalia, Ohio.

Blue Ridge Branch

The Blue Ridge Branch, A.E.S. held

its monthly meeting Dec. 13, 1957, 6:30 p.m. at General Electric Rectifier Division, Lynchburg, Va., *N. F. Murphy* presiding. The meeting began at a dinner at the Virginian Hotel where the forty members and visitors were welcomed as guests of General Electric. Special guests *A. J. Fielder*, professor of physics and *Tom Sweeney*, student of physics were welcomed.

The following members were elected to the branch: *Stewart P. Jackson*, General Electric, Lynchburg. *Eugene O. Eagle*, Wyandotte Chemicals Co., Greensboro, N. C., *H. G. Norris*, Dixie Textile Machine Co., Greensboro, N. C. The membership transfer of *W. J. Miller* was acknowledged.

Howard Welfare brought to the attention of the group the need for support of the Southeastern Branch meeting in advertising and attendance. *P. D. Callahan* then introduced *J. Mungenast* as speaker of the evening. Mr. Mungenast outlined the program and the meeting adjourned to G.E.'s rectifier plant west of Lynchburg, where Mr. Mungenast gave an illustrated lecture on the history of germanium and

silicon rectifying cells, followed by a tour of the assembly lines where rectifiers, transformers, and reactors were made and tested.

MIDWEST JOB GALVANIZERS ASSOCIATIONS, INC.

At the first annual meeting of the newly organized Midwest Job Galvanizers Association recently held in Chicago, members passed a resolution initiating an educational program on the art of hot-dip galvanizing. The program will provide a symposium treatment of high quality hot-dip galvanizing which will be of particular interest to engineers, specification writers, and inspectors. The meetings will include the presentation of technical papers, informal discussions of exhibits and photographs. Meetings will be held in Chicago, Detroit, and other areas served by members of the Association. The Association was formed in 1956. All members are required to maintain membership in the ASTM, and they are to guarantee all galvanizing to comply with the appropriate ASTM specifications.

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News from California

By Fred A. Herr



Kwik Set Locks, Inc., Anaheim, Calif., recently was acquired by the Russwin & Corbin Co., a division of American Hardware Co. of New Britain, Conn.

In a reorganization of the Kwik-Set manufacturing setup, a number of items, such as plumbing hardware, seat belts, wall safes, etc., were eliminated from the firm's production schedule in Anaheim in favor of concentration on lock manufacturing and processing.

The rights to various items in the plumbing hardware line were sold to All-American Manufacturing Co. of Vernon, Calif. Glenn Beckwith, formerly a Kwik-Set sales and technical engineer, was temporarily assigned to

All-American in a consulting capacity to assist during the period of tooling up for the new items.

Beckwith was expected to announce a permanent affiliation with one of the prominent Southern California manufacturers early in 1958. He formerly served as general manager and plating supervisor for Metallon Products Co., Los Angeles.

Lou Barkley, formerly a process engineer with North American Aviation, El Segundo, Calif., recently transferred to the Quality Metal Finishing Co. of Lynwood, Calif., with which firm he is now active as a sales engineer. Barkley moved to Southern California from Kansas City, Mo., in the summer of 1956. He had been president of Kansas City Branch of the A.E.S. and is now taking an active part in the affairs of Los Angeles Branch.

Ajax Hardware Mfg. Co., 4351 Valley Blvd., Los Angeles, recently installed some additional plating facilities

for producing several new finishes in connection with its "Old Copper" line of building hardware. New copper strike and oxide solutions tanks have been installed along with a number of complementing items, for work in connection with drawer pulls, door knobs, hinges, cabinet hardware and a general line of building hardware. The new equipment augments existing facilities for brass, copper, chromium and a number of other plating operations. Oscar Griset is the Ajax plating supervisor.

Ryan Aeronautical Co. of San Diego, Calif., is reported to have developed a practical process for deoxidizing molybdenum, a metal of growing importance in the aircraft industry, for which thus far there was available no effective technique for low temperature cleaning, especially oxide removal.

The Ryan Company's process involves the use of two baths which, according to reports, effectively removes the oxides without attacking the basis metal. Baths used are (1) a deoxidizer with sodium hydroxide as the main

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product: (2) addition of potassium permanganate to the first solution to produce a strong oxidizing solution.

From the chemical reaction standpoint, the bath converts the oxides of molybdenum to a higher valence state and makes them easily removable with a pressure spray rinse and leaving only a black smut on the base metal's surface.

A previous method used in this plant involved a molten salt bath of 70% sodium hydroxide and 30% sodium nitrate at 500-700°. This cleaning method, reportedly, was not satisfactory both because the solution attacked the basis metal and because it was dangerous to personnel.

Turco Products, Inc., Los Angeles, manufacturers of industrial processing and cleaning compounds, announces the appointment to its board of directors of *Harold W. Sanders*, vice president of the Union Oil Co. of California.

Norton Company reports the ap-

pointment of *Robert Cushman* as manager of marketing services for its newly created abrasives division, a news item of interest to West Coast readers in that Cushman formerly served as Norton's West Coast district manager, with headquarters in Los Angeles. He moved to the Worcester, Mass., main office as assistant sales manager of grinding wheels in 1955.

George W. Fulton is the new West Coast regional sales manager for the DeVilbiss Co. of Toledo, O., replacing *D. L. Bohon* who has been transferred to the home office sales department. Fulton makes his headquarters at the company offices in Los Angeles. He has been active in the West Coast sales organization since joining the firm in 1946.

A special Electronics Committee of the Los Angeles Chamber of Commerce in mid-December launched an industry survey with the mailing of

questionnaires to more than 1,000 electronics firms in the Los Angeles metropolitan area.

The survey is expected to provide information for a report to be published in directory form in the spring of 1958 which will contain basic data on physical facilities, range of products, services and processes, human resources, and the productive capacity of the electronics industry in Southern California.

Among data to be sought will be information on the number, type, and size of plating facilities and equipment for printed circuitry operated by electronics firms which, for the first time, will provide a break-down on that phase of Southern California industry.

According to *Charles B. Thornton*, chairman of the Committee, an analysis of electronics activity in 1954 established Southern California's claim to being one of the country's three major electronics centers.

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courses of interest to members of the metal and organic finishing fields were scheduled to start in Los Angeles and San Diego, Calif., in February in the form of university extension classes in engineering and related subjects under the auspices of the University of California at Los Angeles.

Among the courses is one on epoxy resins, their properties, curatives, formulation, principles of resin blends, effect of fillers, diluents, etc. The course will also include discussion on adhesives, coatings, castings, expanded resins, synthetic foams, filament winding, test methods and the handling of epoxy resins.

Section 1 of the course will be offered Wednesday of each week from 7 to 9:30 p.m., beginning February 19 in the Chemical Building at UCLA; Section 2 at Citrus Junior College in Azusa, Calif. Thursday of each week, beginning February 20. The instructor at both places will be *George Epstein*, head of research and development for Aerojet Corp.

A course in surface chemistry, colloids and adhesion is scheduled for

Monday of each week, beginning February 10 at Roosevelt Junior High School, San Diego, Calif. The course will include discussion on application to phenomena of industrial importance, including adhesion and adhesives, detergency, emulsion, absorption and purification processes, and treatment of metals for protection against corrosion.

Other courses being offered are: processing of metals, including metallurgical and chemical reactions — Wednesday night at UCLA, beginning February 12; and industrial quality control, each Thursday evening beginning February 13 at UCLA.

Kasmer F. Tarczynski has returned to the post of general manager of Superchrome Plating & Engineering Co., Inc., Los Angeles, following an absence of nine months during which he was affiliated with Southwest Plating Co., Los Angeles. Tarczynski's return followed a recently completed reorganization of that firm's corporate setup, as a result of which *John*

Ruthvin has become president, and *Nelson Grace* and *Harold Sellette* vice-presidents.

Tarczynski immediately plunged into the task of directing an extensive enlargement and remodeling program which the new executives have decided upon for the Superchrome shop at 1504 E. Washington Blvd., Los Angeles.

An idea of the expansion of production that is anticipated, may be gleaned from the fact that 40,500 amperes are being added to the firm's load. The plant has been completely realigned and streamlined to accommodate new equipment aid to establish several new departments. Four new 1200 and two 300 gallon chromium tanks have been installed, and an entirely new liquid honing and a sandblasting department have been set up. The machine shop has been considerably enlarged to facilitate the design and production of anodes, fixtures and jigs which the firm turns out in its own shop.

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ing it corrosion resistant is included among new facilities recently installed by the Ruby Lighting Corp. of Los Angeles, manufacturers of industrial fluorescent fixtures, as part of a major expansion program. While headquarters of the firm, a subsidiary of Ekco Products Co., are in Los Angeles, the main plant is in Whittier, Calif., to which 150,000 square feet of factory area reportedly have been added.

This is said to be the first time so large and complete a phosphating system has been placed in operation for use in connection with the processing of fluorescent light fixtures. Installed as part of the same expansion program were a double electrostatic paint spray, a photometric testing laboratory, overhead conveyors and motorized belt assembly lines.

Miller Dial & Name Plate Co. of El Monte, Calif., reports the appointment of 45 dealers to cover 37 key industrial area of the United States. They will represent the company in the distribution of a do-it-yourself method for pro-

ducing etched, anodized name plates.

Furane Plastics, Inc., Los Angeles coating manufacturer, has appointed *Donald Brown* as resident manager in the San Diego, Calif., area, where he makes his headquarters at 719 Beryl St.

With the recent installation of facilities for metallography and electrochemistry testing, completion of expansion of existing research facilities of Stanford Research Institute at Menlo Park, Calif., into a \$500,000 Metallurgical Laboratory has been concluded. In its present stage the facility is regarded as the largest west of the Mississippi River equipped to undertake all phases of metallurgy research.

The staff of 17 metallurgists and technicians is headed by *R. H. Thielman*. Activities of the Metallurgy Department, it has been announced, will include work in electrochemistry, process metallurgy, liquid metals and physical metallurgy. One of the main

projects now being conducted concerns a study to discover why high-strength steels are made brittle by hydrogen when cadmium-plated, a project being sponsored by the U. S. Air Force.

Convair, Inc., San Diego, Calif., airplane manufacturers, has come up with an effective technique for assuring small parts to be painted evenly without build-up. Their finishing department makes use of expanded metal trays for conveying small plane parts through the spray booths. The design of the trays permits excess paint to pass through the tray and into the spray booth waterfall. The plant is equipped with a conveyor containing 62 of the trays which carries the parts through two automatic paint spray booths and two drying ovens. Parts on hand-moved trays are painted manually in a color spray booth, after which the trays are placed on a rack to dry. The trays weigh 9 lbs. each. Two hundred of the trays were built in the firm's own engineering department in 21" x 36" size.

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Manufacturers' Literature

Fire Detecting-Extinguishing Equipment

Walter Kidde & Co., Inc.

A new 12-page catalogue, P-40, completely describes and illustrates portable fire extinguishers, built-in carbon dioxide fire extinguishing systems, smoke detecting systems, and rate-of-rise fire detecting systems.

The equipment covered in the book is largely for commercial, institutional, or industrial fire hazard applications.

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Etching Printed Circuits

Becco Chem. Div., Food Machinery and Chem. Corp.

A new process for etching printed circuits with a solution of ammonium persulfate instead of ferric chloride is

described in Bulletin, No. 90, just published. Preparation of the solution, processing instructions, after-treatment, and disposal of the waste solution are fully outlined.

141/Circle on Readers' Service Card Spray Guns and Booths

Paasche Airbrush Co.

A 24-page book, called Catalog 4, describes the manufacturer's line of air finishing booths and equipment. Catalog 3, covering a complete line of automatic spray guns and accessories, includes the newly designed Model 310 and 311 guns.

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Controlled Volume Pumps

Milton Roy Co.

Two-page Bulletin No. 1157 specifies capacities, pressures and materials of construction of a leakproof diaphragm pump for metering corrosive, obnoxious or toxic chemicals. It also describes the features of the pump including the mechanical actuation for correcting the volume of hydraulic fluid between each stroke.

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Diglycol Laurate

Sole Chem. Corp.

Technical Bulletin #1257-1 describes Sole-Onic CDS, diglycol laurate, a self emulsifying type emulsifier and defoamer.

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Heating Elements

Quartz Products Corp.

Bulletin 571 illustrates and describes 2.3 micron quartz Infratube heating elements. It lists their advantages, commercial and industrial uses, and mounting dimensions.

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Catalytic Coatings

Industrial Finishes Co., Inc.

An 8 page illustrated color brochure describes a wide range of Ifco catalytic protective coatings, industrial usage, and product adaptability.

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Plastics

Bakelite Co.

The 1958 edition of the "Condensed



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THE IDEAL ADHESIVE

For Setting Up or Recoating
Polishing Wheels, Abrasive
Belts & Discs

Nuglu, a liquid glue, developed to lengthen wheel life — produce a better finish, and increase metal finishing production.

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A mixture of Nuglu and graded aluminum oxide grain —

Save on operating costs, increase production, reduce wheel inventories, and obtain greater results, with less costly materials, in fine polishing work!

Ask for information on The Siefen Finishing Systems

— Also for better metal finishing use Siefen Compositions • Stainless Steel • Bar (Grease) in Tube • Liquid Tripoli • Liquid Grease • Lapping Compound • Burring Compound.

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J. J. SIEFEN CO.

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Our Thirtieth Anniversary

1957*

147/Circle on Readers' Service Card

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A large national firm* writes: —

"AGATEEN #13C has been found superior to other clear finishes in every respect for name plate applications."

*Name on application

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MANUFACTURING CO., INC.**

SERVING INDUSTRY SINCE 1927

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Stilwell 4-0660 - 1

AGATEEN!

THE LAST WORD IN QUALITY

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Reference File" describes in easy, readable terms the major families of plastics produced by the above company. The 12-page booklet is profusely illustrated and has thumb-indices to aid in finding data on polyethylenes, vinyls, styrenes, phenolics and epoxies. The broadest range of plastics materials available from a single source is shown.

149/Circle on Readers' Service Card

PVC-Protected Aprons, Gloves, Garments

Jomac, Inc.

A new line of polyvinyl chloride-impregnated industrial clothing, garments, gloves and aprons, combining light weight, unusual flexibility and resistance to chemicals, oils and abrasion is illustrated in three bulletins.

The individual bulletins, one each for general clothing, gloves and aprons, describe and illustrate product features and detail the range of sizes, styles and colors that are available.

150/Circle on Readers' Service Card

Government Specifications Catalog

Magic Chemical Co.

A new edition of "Adhesives, Sealants, Paints and Coatings Listed According to Government Specifications" is useful to all purchasing and procurement officials of companies handling government contracts, or who need

products conforming to government specifications.

The catalog is divided into three sections, listing government specifications number and by title and the corresponding company product numbers.

151/Circle on Readers' Service Card

Gloves

Mine Safety Appliances Co.

Gloves made of five types of molded rubber and synthetic materials in various weights, sizes, and types are introduced and described in an 8-page Bulletin, 1310-2.

A selection guide showing the relative resistance of the different materials to nearly 200 common chemicals and their comparative physical characteristics is featured. A line of finger cots are also included.

152/Circle on Readers' Service Card

Masking Tapes

Minnesota Mining and Mfg. Co.

A revised brochure, describing technical properties of masking tapes and various industrial applications for them, lists 13 "Scotch" brand masking tapes, including two new types, together with such properties as tensile strength adhesion and percentage of stretch.

It also lists the uses for which each tape is best suited and, in eight picture sections, illustrates applications

ranging from general masking to high heat masking to plant maintenance.

153/Circle on Readers' Service Card

Synthetic Safety Clothing

Milburn Co.

This six-page booklet offers comparison of chemical resistance and safety factors of nine families of synthetic fabrics and films available in safety clothing.

Resistances are enumerated for Dynel, Orlon, Dacron, Acrilan and vinyl-coated fabrics, and for vinyl and polyethylene films. Information is also given on the fire-resistant, anti-static, liquid-repellent and lint-free properties of the various synthetic fabrics. Laundering characteristics are given.

154/Circle on Readers' Service Card

Humidity & Temperature Instruments

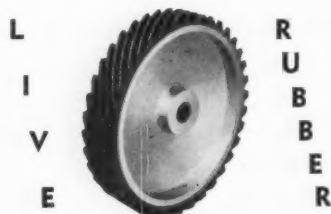
Serdex, Inc.

A new information-packed six page catalog describes design and construction details for a complete line of humidity indicators, recorders and controllers. Accessory photographs and descriptions are included.

Indicating hygrometers described include both portable and utility models. Indoor-outdoor recording instrumentation for humidity or humidity-temperature are also included.

155/Circle on Readers' Service Card

Now Available!



CONTACT WHEEL

The New Duro-Red Live Rubber contact wheel — Faster, smoother, cleaner grinding and polishing.

It's the Live Rubber that makes the difference. It's been proven!

WRITE TODAY FOR INFORMATION.

THE NAZAR RUBBER CO.
2727 Avondale, Toledo 7, Ohio

156/Circle on Readers' Service Card

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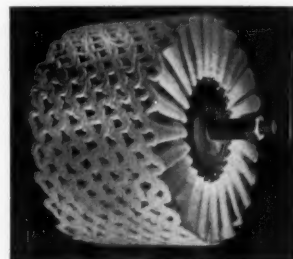
THE LOFGREN PROCESS

Plants:

Linden, N. J.
Southington, Conn.

157/Circle on Readers' Service Card

Cooler, Faster Buffing with 45° Spoke Buffs



Patented spoke mounting principle maintains best cutting angle of 45° for faster, smoother cutting with less pressure and no streaks. Ventilation from 24 openings.

Write for folder.

GUARANTEED BUFF CO., INC.
20 VANDAM ST., NEW YORK 13, N. Y.

158/Circle on Readers' Service Card

Cleaning with Silicates

Philadelphia Quartz Co.

A new folder describes industrial cleaning with Metso silicate detergents. Types of surfaces cleaned of soils most commonly encountered are discussed in terms of six essential steps in soil removal. Seven detergents are described for specific cleaning requirements. A chart offers suggested concentrations and general directions for more than 25 cleaning operations.

159/Circle on Readers' Service Card

Wire Baskets

Wire & Iron Products, Inc.

A new information bulletin, MS-57, describes the wide range of wire parts-handling baskets available for conveying and processing production parts. Also shown are conveyor hooks, plating racks and many special purpose materials handling items.

Wire machinery guards, conveyor catch guards and other safety products manufactured by the firm are also shown.

160/Circle on Readers' Service Card

Temperature Controls

Parlow Corp.

"Thermal Element Selection Guide for Corrosive Atmospheres" lists more than 400 separate corrosive atmospheres into which temperature control elements are often immersed. In easy-to-read chart form the company lists the recommended bulb material and other information relating to sustaining the life of temperature sensing bulbs in each atmosphere. Bulletin No. 110.

161/Circle on Readers' Service Card

Plastic Type Protective Coating

Mono-Seal Products

A new technical bulletin just released presents the features, properties and characteristics of Mono-Seal, a super-tough, plastic type protective coating, recently developed.

The bulletin describes the basic characteristics, plus complete data on application, drying times, coverage and surface preparation. A special "Value Analysis" section provides a guide for economic selection of coating materials by analysing coverage, surface-life, surface preparation, drying time, loss of operating time, and refinishing cycles.

162/Circle on Readers' Service Card

Compressed Air Dryers

Van Products Co.

A 12-page bulletin describes new models of heatless, self-activating, zero-dew-point dryers designed to prevent moisture fouling of instruments, controls, testers, circuits, chemicals, gases, finishes, compounds, solutions, etc.

163/Circle on Readers' Service Card

(Continued on page 131)

Thanks for Your Christmas Cards!

We acknowledge with sincere thanks the kind thoughts expressed in the Christmas cards received from the following:

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Andrews, C. H.

Aurilite Process Co., The

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Bakinow, Leo

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Beaver, H. LeRoy

Benach Advertising Agency, Henry

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Nadel, Milton

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GOBLET BUFFS, TAPER BUFFS, CYLINDER BUFFS, SMALL POLISHING WHEELS, RAZOR EDGE BUFFS, and many others for deburring, polishing and grinding any internal contour.

Write for additional information or contact your local dealer. These buffs are stocked by many dealers throughout the country.

We manufacture a COMPLETE LINE OF BUFFS including full disc loose and sewed buffs and polishing wheels. Our metal center BIAS TYPE BUFF may help cut your polishing costs.

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BARKER BROTHERS INC.

ESTABLISHED 1911

1660 Summerfield Street

Brooklyn 27, N. Y.

Canadian Distributor — LEA PRODUCTS COMPANY, Montreal

164/Circle on Readers' Service Card

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- 1—5000/2500 ampere, 9/18 volt Chandeysson Syn. 25° exciter in head. Built in 1943.
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GUARANTEED REBUILT PLATING RECTIFIERS — 3 PHASE, 60 CYCLE, 220/440 VOLT. COMPLETE WITH OPERATING ACCESSORIES.

Rapid Electric Selenium Type 5000A, 0-6 Volt.
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SPECIAL

Koroseal-lined Tanks, 7' x 4' x 4'6".
Koroseal-lined Tanks, 5' x 42" x 3'.
LaSalco 2 cyl. Mechanical Plating Barrel Unit for cyanide solutions, 16" x 36".
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#2 Globe Tumbling Barrels M/D
#5 Globe Tumbling Barrels M/D
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Industrial Filter — Acid — 100 GPH

NEW AND REBUILT POLISHING AND BUFFING LATHES — CONSTANT AND VARIABLE SPEED — SINGLE AND DOUBLE MOTOR DRIVES — 3 PHASE, 60 CYCLE, 220/440 VOLT, 1 TO 20 H.P. IN STOCK.

LATHES

L'Hommedieu double 5 H.P. Model 18A Vari-Speed
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Hammond Double 5 H.P. Model RR Constant Speed
Hammond 5 H.P. Model RH Constant Speed
Cincinnati Double 5 H.P. Constant Speed
Divine 5 & 7½ H.P. Model VCS Constant Speed
Gardner 5 - 7½ H.P. Model 3DB Constant Speed
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Acme Semi-Automatic Work Holders

NEW CLINTON FAN COOLED SELENIUM RECTIFIERS COMPLETE WITH BUILT-IN VOLTAGE REGULATION AND ALL NECESSARY OPERATING ACCESSORIES.

WE CARRY A COMPLETE LINE OF NEW AND REBUILT PLATING AND POLISHING EQUIPMENT.

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IMMEDIATE SHIPMENT!

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- 1—10,000/5000 AMPERE, 6/12 VOLT. H-VW-M Synchronous. Exc.-in-head.
- 1—8000/4000 AMPERE, 6/12 VOLT. CHANDEYSSON, Synch.
- 1—7500/3750 AMPERE, 9/18 VOLT. HANSON - VAN WINKLE - MUNNING, Synchronous.
- 1—6000/3000 AMPERE, 6/12 VOLT. ELECTRIC PRODUCTS, Synch.
- 1—5000/2500 AMPERE, 9/18 VOLT. CHANDEYSSON, Synchronous. Exciter-in-head.
- 1—4000/2000 AMPERE, 6/12 VOLT. H-VW-M, Synch. Exc.-n-head.
- 3—3000/1500 AMPERE, 12/24 VOLT. CHANDEYSSON, Exciter-in-head.
- 1—2000/1000 AMPERE, 6/12 VOLT. HANSON - VAN WINKLE - MUNNING.
- 1—1500/750 AMPERE, 12/24 VOLT. CHANDEYSSON, Synchronous.

ANODIZERS

- 1—1000 AMPERE, 40 VOLT. CHANDEYSSON, 25°C.
- 1—1000 AMPERE, 30 VOLT. IDEAL, Exciter-in-head.
- 1—750 AMPERE, 60 VOLT. HANSON - VAN WINKLE - MUNNING, Synchronous, Exciter-in-head.
- 1—500 AMPERE, 25 VOLT. CHANDEYSSON, Synchronous, Exciter-in-head.
- 4—400 AMPERE, 40 VOLT. M.G.C., Separately Excited.

RECTIFIERS

- 1—G. E. 2000/1000 AMP., 6/12 V.
- 1—SEL-REX SELENIUM, 1200 AMPS. 9 V. for 440/3/60.
- 1—1500/750 AMPERE 6/12 VOLT, UDYLLITE-MALLORY.
- 4—1440/720 AMPERE, 6/12 VOLT, UDYLLITE-MALLORY.
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- 2—CROWN & H-VW-M Centrifugal Drills No. 1 and No. 2 with Heat.
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- 2—RONCI Enamellers, Nos. R-100 & R-200.
- 2—ALMCO DB2 and DB8 Deburring Barrels; 2 Comp. Vari Drive.
- 2—No. 101 Production Pipe Polishing Machines.
- 1—No. A-2 ACME semi-automatic 2 spindle buffing head.
- 4—L'HOMMEDIU 5 HP Variable Speed Buffing Lathes.

Other outstanding values in stock. You'll save more if you check M. E. Baker first for all your plating, anodizing and metal finishing needs.

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Kirkland 7-5460

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PRICED RIGHT AND READY FOR IMMEDIATE DELIVERY

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30 Plating Barrels: Crown — Udyllite — HVWM — various sizes.

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6 Semi-Automatic Plating Tank Units: Udyllite 20' — HVWM 20' — Crown 35' — U. S. Galvanizing 12', 16' and 20'.

1 HVWM 4 station Plating Barrel Unit: 36x14; rubber lined tank, rubber cylinders.

4—Industrial RDR2 rubber lined filters & slurry tanks. 4500 gal. per hr. Sizes 36-36-30 with AC 3 ph. motor complete.

3 Blakeslee Niagara Single Stage Motor Driven conveyor washers 8' long with 18" wide belt.

10-Mears Kane Ofeldt gas fired steam tubular boilers. 2-20 HP with pump units.

10 Centrifugal Dryers: acid crocks, motor driven exhaust fans, fume blowers, complete acid and dip rooms, cleaning and washing tanks, plating racks and many other items.

30 Rubber lined Nickel Plating Tanks: 2' to 12' long; with rods, rheostats, motor driven tank rod agitators, heating coils, etc.

16 DETREX, BLAKESLEE, CIRCO, Steam, Gas and Electrically Heated Degreasers: 3' to 6' long, single dip and 3 dip type, with pumps, tanks, fume ducts.

12 STEINER IVES and GEHRICH Paint Baking and Drying Ovens: electric, all sizes; full automatic, recirculating type with controls, fans, blowers.

CHANDEYSSON: 1000 amps to 5000 amps. HVWM: 500 amp. - 5000 amp.

HOBERT: 100 amp. - 2000 amp.

COLUMBIA: 1000 amp. - 4000 amp.

BOGUE ELECTRIC: 500 amp. - 3000 amp.

AMERICAN GIANT: 250 amp. - 4000 amp.

ANODIZERS: 5 to 40 volts; 100-3000 amps. all above complete with motors, panel board, starting equipment; separately excited, interpole type.

ALL SIZES — TUMBLING BARRELS: Abbott — Baird; complete with stones and steel balls.

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INSPECTION INVITED

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PRICED RIGHT FOR QUICK SALE

- 24" Unichrome Chromium Plating Barrel with solution, blowers etc.
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- Centrifugal Dryers — Kroider and Crown with heat.
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- Udylite Rectifiers — 1440/720 Amps. 6/12 volts.
- Baird Oblique Tumbling — Wood or Steel Tubs.
- Crown Portable Plating Barrel (all solutions).
- Plating Barrels 14" x 24" — 14" x 30" — 14" x 36". With hoists.
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Model #VM-325-2S DETREX SOLVENT DEGREASER Steam Operated, Conveyor Type. 10 gauge Corrosion Resistant Steel. Capacity 2,000 lbs. of aluminum per hour. Variable Speed 11 to 22 ft. per min. Model #S-60 Detrex Solvent Still including (2) 3 H.P. 1750 RPM Motors for Spray Pumps. Conveyor opening 18" x 24", weight 11,200 lbs. Overall dimensions 38' long x 13 1/2' high x 6 1/2' wide \$7,500.00

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225 STEEL BASKETS, Rack Type Chrome Plated Lot price \$400.00

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- 10000/5000 Amp. 9/18 Volt, Chandeyson Motor Generator Sets, with Direct Connected Exciters, Panels and Starters, Synchronous Driven, 300 RPM. (1943 Machines) used less than 2 years, like new condition. All 4 machines identical and presently located in Milwaukee, Wis. Motors are presently arranged for 2200 volt 3 phase, 60 cycle operation, but will reconnect for either 440 or 220 volt hook-up.

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Acme 30" Rotary Automatic Polishing and Buffing Machine. 6 station table, 4 adjustable floating head lathes. Also includes dust collecting system, all motors, magnetic controller panel and automatic compound applicators, 4 years old used approximately 2000 hrs.

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- G.E. 6 v. 500 amperes units w/new selenium stacks, \$325.00.
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- Rapid 24/48 volt, 4000/2000 amperes with new Germanium Stacks.
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- Chandeyson 1000 amp. 6 volt generator.
- Rapid 2000/1000 amp. 48/24 volt selenium rectifier.
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- Electro-Products 400 amp. 24 v.
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- Hammond Double 5 H.P. Lathes.
- Hisey Wolf 5 H.P. Var. speed pol. mach.
- U. S. #35 Var. speed 5 H.P. pol. mach.
- New 5 H.P. Lathes \$385.00; 7 1/2 H.P. \$445.00.
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- Pesco & Pesco type 3-5-7 1/2 H.P. polishing lathes.

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- Hammond OD-9.

MISCELLANEOUS

- Gas Baking Ovens 78" high, 72" deep, 36" wide, I.D. with all controls.
- LaSalle 14" x 42" complete line, cleaning, plating, rinsing, melamine barrels.

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- Alsup RR & WR 5" & 7" steel & stainless steel.
- Various makes steel and stainless steel.

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- Udylite 16" x 42" Lucite Cylinders, cleaning, pickling, plating & rinse line with 6-16" x 42" lucite cylinders, ideal for cadmium or zinc.
- Daniels #28.
- Stevens 6 barrel 20" horseshoe type semi-automatic w/5 extra barrels.
- #23 Rubber Lined Daniels.
- #24 Rubber Lined Daniels.

TUMBLING EQUIPMENT

- New LaSalle Tilting Type.
- Alsup 32" x 32".
- Abbotts 8" x 30", 16" x 30" single and double, belt and motor driven.
- Baird #1 Stand motor driven.
- Globe Tumbling Barrels.
- Henderson Tumbling Barrels.
- Crown #452 2 Comp. Neoprene lined 5 H.P. Vari Drive.

DRYING EQUIPMENT

- 18" Crown Centrifugal.
- 18" Merrill Centrifugal.

DEGREASERS

- 28" Detrex Conveyorized.
- 15" Barrel Type Detrex Degreaser.
- 20 Degreasers 14" to 7" all makes, steam, gas, electric.

TANKS

- 16" x 42" x 36" steel rubber lined.
- 200—S.S., Monel, Steel, Brick, Lead, Rubber Lined, all sizes.

Pesco Plating Equipment Corp.

Plating, Polishing, Grinding, Spraying, Baking, Drying, Tumbling, Cleaning, Degreasing & Anodizing Equipment. Anodes, Chemicals, Acids, Cyanides, Solvents, Supplies for Wood, Plastics and Metals.

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ANODIZING • RUSTPROOFING • PLATING • BARREL FINISHING
VACUUM METALIZING • LACQUERING AND ENAMELING

PLATERS AND ANODIZERS

M-G SETS — Motor 3-60-220/440

Amp.	Volt	Make
175	14	Delco
200	7½	Chandeysson
300	7½	Hobart
400	60/60	G. E.
750/375	6/12	Excel
940	32	Elec. Prod.
1000/500	6/12	Chandeysson
1500/750	6/12	H.V.W
1500	15	Star
1500	30/50	Century
1500	40/65	G. E.
1500	65	Westinghouse
1500	70	Century
2500/1250	6/12	Elec. Prod.
5000/2500	6/12	Chandeysson
5000/2500	6/12	Columbia
5000/2500	9/18	Chandeysson

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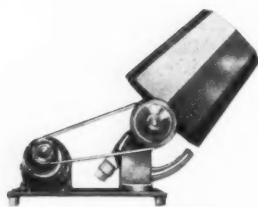
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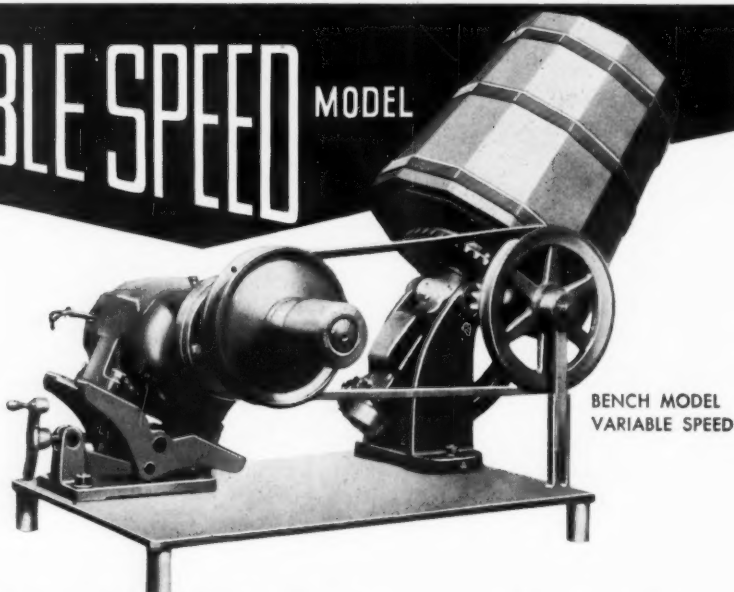


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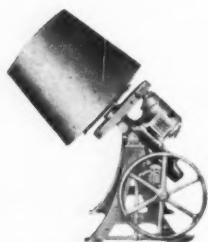
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VARIABLE SPEED



No. 5—Single Speed



No. 5A—Single Speed



No. 6—Single Speed

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Work can be watched — samples removed for inspection — *while running*.

Angle can be changed for best abrasive or polishing action — *while running*.

Barrels can be emptied by tilting to pouring position — *while running*.

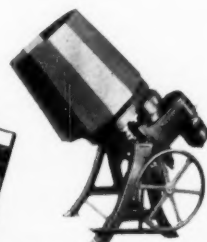
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No. 6—Variable Speed

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Electroplating Course

Joseph B. Kushner Electroplating School

A new two-color folder, illustrated with ten photographs, gives the "inside" story of the above school. The illustrations are action shots of each department of the school, starting with the preparation of lesson material, going through laboratory tests, marking of examination papers, shipment of lesson books and a conference on new lesson material designated for inclusion in the world famous correspondence course, "Electroplating Know How."

170/Circle on Readers' Service Card

Airless Spray Painting

Nordson Corporation

A new six page brochure tells about the airless spray painting process, also answering general questions regarding this method. Applications and related advantages are described.

171/Circle on Readers' Service Card

Electroplating and Corrosion

Cobalt Information Center,
Battelle Memorial Institute

"Bibliography on Electroplating Cobalt and Cobalt Alloys" in a 16-page publication encompasses literature on the electroplating of cobalt and its binary and ternary alloys to June, 1957. References to United States and foreign patents are included.

A newly-revised edition of "Corrosion Bibliography on Cobalt and Cobalt Alloys" is also offered. This listing contains over 150 references to literature published to mid-1957.

172/Circle on Readers' Service Card

Graphite Heat Transfer Equipment

Heil Process Equip. Corp.

A new bulletin, "Nocordal Impervious Graphite Heat Transfer Equipment for Corrosive Chemicals," describes heat exchangers, immersion heaters, and jet agitators, constructed of graphite. The new bulletin gives flow-rates and effective heat transfer areas for standard multiple tube and concentric tube heat exchangers of

various sizes. It also offers diagrams and illustrations of immersion heating units, electric immersion heaters, and steam jet agitators, suitable for preliminary engineering and design work.

173/Circle on Readers' Service Card

Aluminum Bright Dip

MacDermid, Inc.

Aluminum Bright Dip No. 2, used to produce a brilliant lustre on non-silicon aluminum alloys, is fully described in Technical Data Sheet No. 21, a two-page usage and instruction sheet.

A liquid addition agent, called Aluminum Bright Dip Corrective Solution, for use in nitric-phosphoric acid bright dip baths to restore the lustre producing properties, is fully described in Technical Data Sheet No. 21B-2, a usage and instruction sheet.

174/Circle on Readers' Service Card

Abrasive Belt Grinding

Engelberg Huller Co.

This new two-color 24-page booklet contains over thirty illustrated case histories selected after a two-year coast-to-coast survey of abrasive belt machine applications. On-the-job data includes production figures, type of belts used, belt life, fixturing, comparison with prior or alternative methods; and stock removal, tolerance, and finish specifications.

175/Circle on Readers' Service Card

Finishing Equipment

Randall Manufacturing Co., Inc.

The above firm has issued an illustrated bulletin on its engineered equipment including spray booths, degreasers, washers, dryers, tanks, ovens, paint strippers, etc.

176/Circle on Readers' Service Card

February 1958

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WESTWOOD, NEW JERSEY

Tumbling Media
Electro-Minerals Div.,
The Carborundum Co.

A new envelope-size folder describing current lines of tumbling media and listing specifications and prices has just been issued.

Designed as a vest-pocket reference on tumbling media for barrel finishing, the folder describes and lists general applications for aluminum oxide tumbling nuggets, grain and vitrified tumbling pellets, as well as for Carborunds, rubber bonded tumbling media.

177/Circle on Readers' Service Card

New Literature Release

Eclipse Air Brush Co.

A giant size folder shows a new complete line covering all phases of spray equipment. The literature reviews and introduces many newly developed products.

178/Circle on Readers' Service Card

High Vacuum Pumps
NRC Equipment Corp.

High vacuum diffusion and booster diffusion pumps are the subject of a twelve page bulletin just issued. Outline drawings, tables, and large scale speed curves present full physical and operating specifications for both mercury and oil pumps with speeds ranging from 10 to 11,000 cfm. Throughput curves of diffusion, booster diffusion, and mechanical pumps are displayed on a common grid to simplify the selection of an appropriate high vacuum pump and of a matching mechanical pump. The bulletin also explains how diffusion pumps work, itemizes the design and construction features of the pumps and the resulting benefits to the user, and present formulas used in designing high vacuum systems.

179/Circle on Readers' Service Card

Analysis of Plating Solutions
Hanson-Van Winkle-Munning Co.

"Simple Methods for Analyzing Plating Solutions," a 36-page, two-color booklet, is prefaced by a discussion of analytical principles, use of apparatus and methods for sampling a plating solution. It then outlines in detail the necessary steps involved in 28 analytical methods for testing nickel, copper, silver and other metal finishing solutions.

Other sections of the bulletin describe necessary equipment, component chemicals of solutions, atomic weights, acid concentrations and electrochemical data. Conversion tables are included. Analytical reagents are listed for brass, cadmium, chromic acid, copper cyanide and sulfate, gold, nickel, silver, tin and zinc plating solutions.

180/Circle on Readers' Service Card

Power Brushes

Osborn Mfg. Co.

A new two color, eight page folder illustrates by copy and photographs, both the Siftut and Helituf characteristics, brush specifications and job applications.

181/Circle on Readers' Service Card

Activated Carbon

Industrial Chemical Sales Div., West Virginia Pulp and Paper Co.

A 12-page booklet entitled "Powdered Activated Nuchar for Purification and Reclamation," offers helpful hints on its use for the removal of impurities.

182/Circle on Readers' Service Card

Regulator Valve Sizing

Jordan Corporation

New 4-page Bulletin J-SC shows how to size OPW-Jordan sliding gate regulator valves. Technical data (applying to all makes of valves) tells how to adjust sizing for variations in pressure, temperature, viscosity, specific gravity, etc. Charts cover steam, liquid, and gas services. Cross-reference method of compiling eliminates need to use rulers or slide-rules.

183/Circle on Readers' Service Card

Fume Washer

Line-O-Coat Co.

A corrosion-free plastic fume washer with cyclone action is described in detail in a four page illustrated folder just issued.

The brochure contains in-use photos of the unit, plus a cross-section drawing showing pertinent information.

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READER SERVICE DEPARTMENT — METAL FINISHING

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February 1958

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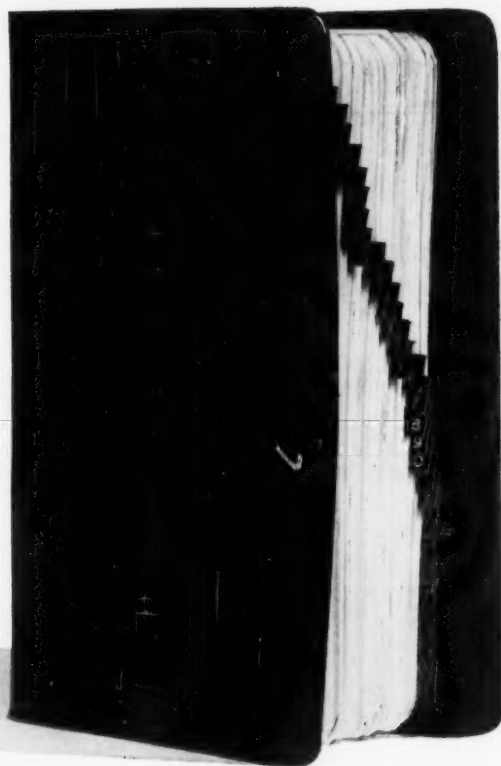
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